Asphyxiating Asia

Tomas Mac Sheoin

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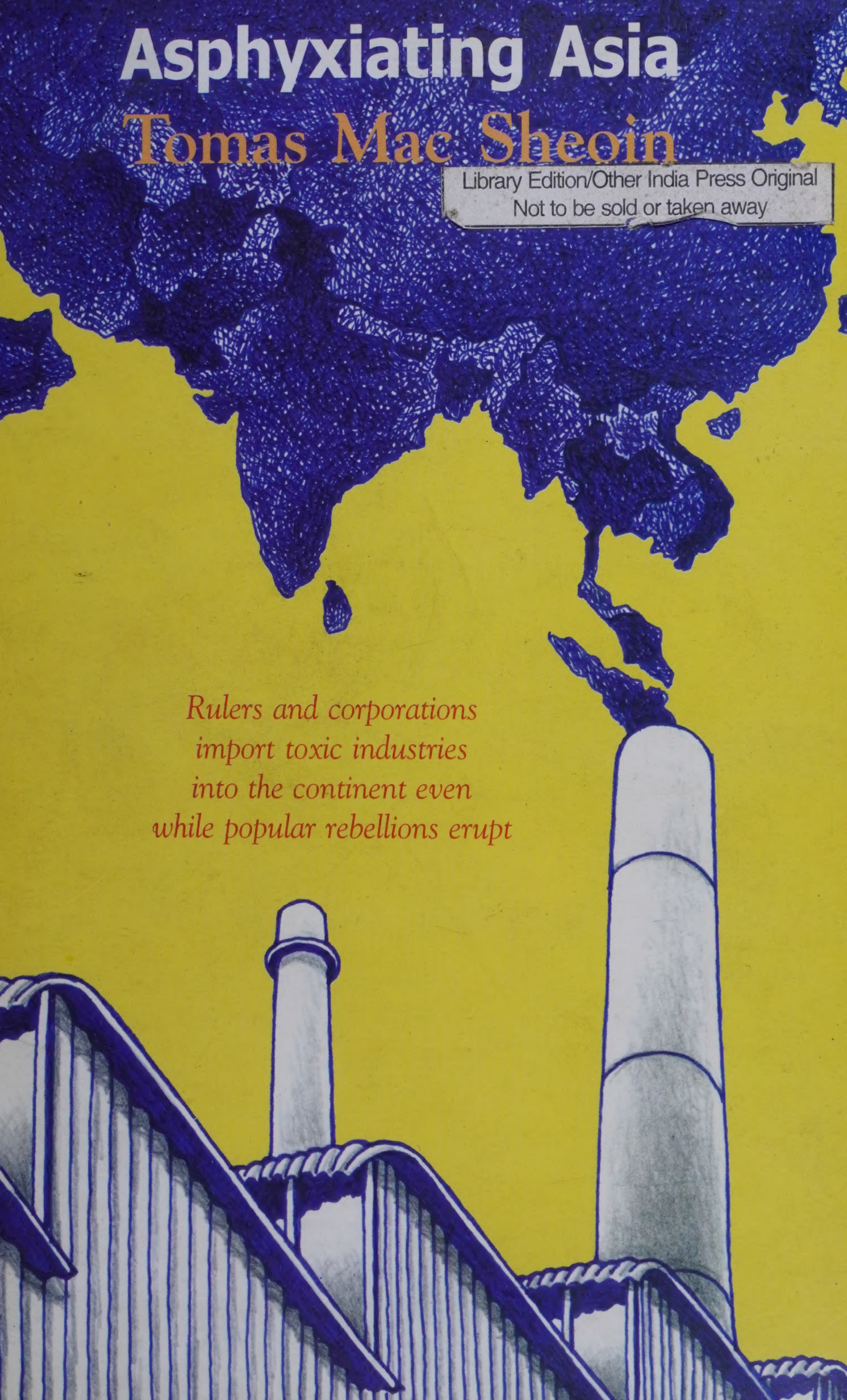

Rulers and corporations
import toxic industries
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THE OTHER INDIA

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Tomas Mac Sheoin

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by Tomas Mac Sheoin

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This book is dedicated to the memory of

Merce Serra Gili

a lover of India
who died while the book was being written.
Bom Shankar!

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Tomas Mac Sheoin

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Abbreviations

Some sources are cited so often in the text that they have been abbreviated to avoid tedium for both typist and reader. The following list matches abbreviations with sources.

ACN	*Asian Chemical News*
APC	*Asia Pacific Chemicals*
BP	*Bangkok Post*
BsAs	*Business Asia*
BsIn	*Business India*
BsWk	*Business Week*
C&I	*Chemistry and Industry*
CEN	*Chemical and Engineering News*
CEx	*Cork Examiner*
China Env News	*China Environmental News*
ChWk	*Chemical Week*
CMR	*Chemical Marketing Reporter*
DTE	*Down To Earth*
EBB	*Environmental Business Briefing*
ECN	*European Chemical News*
Ecol	*Ecologist*
Econ	*Economist*
EIAR	*Environmental Impact Assessment Review*
EnvDig	*Environment Digest*
EPW	*Economic and Political Weekly*
EST	*Environmental Science and Technology*
FEER	*Far Eastern Economic Review*

FT	*Financial Times*
Guard	*Guardian*
HP	*Hydrocarbon Processing*
IHT	*International Herald Tribune*
Indep	*Independent*
MM	*Multinational Monitor*
NI	*New Internationalist*
NLR	*New Left Review*
NS	*New Scientist*
NST	*New Straits Times*
NYRB	*New York Review of Books*
NYT	*New York Times*
Obs	*Observer*
OECD Obs	*OECD Observer*
ToI	*Times of India*
TT	*Taipei Times*
TTU	*Toxic Trade Update*
WHIN	*Workers Health International Newsletter*
WSJ(E)	*Wall Street Journal (Europe)*

Some other abbreviations are used frequently in the text. This list excludes one-off use of abbreviations where the original name and abbreviation are used very close together, as well as the names of international organisations (e.g. ASEAN).

ADB	Asian Development Bank
AFC	Asian Financial Crisis
ATM	Automated teller machine
BAIRs	Bureaucratic Authoritarian Industrialising Regimes
CCP	Chinese Communist Party
CPCB	Central Pollution Control Board (India)
EA	Environment Agency (Japan)
EIAs	Environmental Impact Assessments
EOI	Export oriented industrialisation

EPZs	Export processing zones
FDI	Foreign direct investment
FPG	Formosa Plastics Group (Taiwan)
FTZs	Free trade zones
HCI	Heavy and chemical industry
HDPE	High density polyethylene
IBRA	Indonesian Bank Reconstruction Agency
ICFTU	International Confederation of Free Trade Unions
IFC	International Finance Corporation
ISI	Import substitution industrialisation
kg/yr	Kilogrammes/year
KMT	Kuomingtang (Taiwan)
LDPE	Low density polyethylene
M & A	Mergers and acquisitions
MIDC	Maharastra Industrial Development Corporation
MITI	Ministry of International Trade and Investment (Japan)
MNCs	Multinational corporations
NFI	New Forms of Investment
NICs	Newly industrialising countries
NIEs	Newly industrialising economies
NIMBY	Not in my backyard
PCB	Polychlorinated biphenyls
PE	Polyethylene
PS	Polystyrene
PVC	Polyvinyl chloride
R & D	Research and development
SEZs	Special economic zones
SMEs	Small and medium enterprises
SOEs	State-owned enterprises
TDI	Toluene diisocyanate
TPA	tonnes per annum
VCM	Vinyl chloride monomer

1

Introduction

Development as mass poisoning

A new economic star rose in the east in the second half of the twentieth century, and capital's commentators – from populists to international banks – all hailed its arrival. If you believe the hype, something important has been taking place in the Asia Pacific region, or maybe on the Pacific Rim, or maybe in all of Asia. Its significance, of course, depends on whom you are listening to. To some, we are looking at a sea change: a relocation of core industrial production to the Pacific area. To the World Bank, the IMF and numerous right-wing economists, we are witnessing Asia's economic miracle, a victory of *laissez-faire* capitalism. To still others, these changes presage nothing less than the dawning of the Pacific Century.

While this rhetoric changed sharply during the period of the Asian Financial Crisis (AFC) – when the miracle economies transformed overnight into cesspools of crony capitalism – the Asian hype returned with the quick recovery from the crisis, with the emphasis now on the current blue-eyed boy, the People's Republic of China (PRC). Four quotes should give the reader a flavour of the literature:

"'Asia is going to boom for the next 20 to 30 years," predicts Lee Kuan Yew, former prime minister of Singapore and the father of that city-state's phenomenal growth over the past 30 years. "I think the economic focus is going to shift because of the numbers (of people). It's an

enormous transformation of the world." He predicts East Asia, adjusted for purchasing power, could account for half of the world's economy in 20 years, up from about 25% today.' (*Forbes* 15/7/96: 109)

John Naisbitt, megatrend-spotter, claims: 'What is happening in Asia is by far the most important development in the world. Nothing else comes close, not only for Asians but for the whole planet. The modernization of Asia will forever reshape the world as we move towards the next millennium.' (*FEER* 16/11/95: 80)

Others have seen victory for 'Asian values'. Shintaro Ishihara, writing with Mahathir Mohamed, Prime Minister of Malaysia, in their book *An Asia that can say No*, expounds: 'Oswald Spengler's *Decline of the West* prophesied what is now unfolding before our eyes: the West is reaping what it sowed. In the new era, East Asia, once so wantonly colonised and plundered, will sustain global prosperity.' (*Guard* 5/1/96: 10)

A more materialist view is provided by Japanese observer Watanabe: 'The centre of gravity in the modern civilisation of industrial technology is shifting from the Atlantic region, especially to the countries located on the western rim of the Pacific Ocean ... A global relocation of industrial production capacities towards the Western Pacific is progressing at a rapid pace.' (Watanabe: 148-149)

Finally, it should be noted, some dissidents denounce Asia's economic miracle as a myth, deriding the tigers as paper tigers.[1]

In the midst of all this opinion, it is difficult to sift what is going on from the propaganda about what is going on. *Forbes* remarks on the nature of the rhetoric used: 'The style of language used to describe Asian economic growth increasingly oozes a distinctive enthusiasm symptomatic of the new mood of optimism. It is now common to hear that the "Newly Industrializing Economies" represent an "economic miracle" which is heralding the "North-East Asian ascendancy". "The Pacific Century" is about to commence, realizing "the Pacific destiny" ... The region "economically and industrially is gearing up to dominate the planet in the twenty-first century." The image being constructed of Pacific Asia highlights its aggression, its virility and economic success.' (*Forbes*: 56)

Western commentators have been struck by a dose of metaphors, particularly animal ones – South Korea, Taiwan, Hong Kong and Singapore are the Four Tigers or the Four Dragons – or to more cynical observers – the Gang of Four. Gazing south at ASEAN, commentators have waxed lyrical about the little dragons, but reach orgasmic levels

when dealing with the Great Dragon – China – a land which induces even hardheaded Zeneca executives to speak poetically of second tides and suchlike phenomena. The technical economic language also keeps changing: What were first called 'Newly Industrialising Countries' (NICs) became 'Newly Industrialising Economies' (NIEs) and later, 'Dynamic Asian Economies' (DAEs) or 'High Performing Asian Economies' (HPAEs).

If what is actually going on sounds confused, so is the area in which it is taking place. Judging from the literature, there has been the creation of no less than a new geographical area – Asia Pacific, which sounds suitably Orwellian. Throughout the literature, the boundaries of this area constantly shift in a suitably flexible post-modern fashion, often corresponding to the interests or projects of those promoting them. Often what is excluded is the most illuminating aspect of these models. One model highlights the Rim; this embraces both sides of the Pacific. The ideology behind this is obvious: Seoul has more in common with Seattle than with Burma. In this model, the peasant masses of continental Asia, in particular those of India and China, are most obviously excluded, though the south China coast is included. Other models spread further into the Asian landmass, though often in different directions. The most obvious omission is the Soviet Far East, though this is now appearing in some of the proposed growth triangle models. Others are now welcoming the more complete integration into the world system of the supposedly more autonomous, and supposedly socialist, economies of the People's Republic of China, India and Vietnam.

Asia's market miracle

Before providing details on Asian growth in specific market sectors, it should be recognised that the achievement of these Asian states was indeed phenomenal. 'Several economies – Hong Kong, South Korea, Singapore and Taiwan – are credited with telescoping into just 40 years a level of social and economic development that took Western Europe three centuries to achieve.' (*IHT* 27/4/00: 15)

At the beginning of the 1990s, great things were expected from both consumer and industrial markets in Asia. A 1994 EU study noted that, by the year 2000, one billion Asians will have significant consumer spending power, with 400 million having average disposable incomes at least as high as Europeans and Americans. (*FT* 14/7/94: 6) If the existing market in Asia is attractive, the potential market makes capitalists wet their

pants. This is exemplified by the 'China dream' of two billion new consumers.

The International Energy Agency expected energy demand in the Pacific region to increase 70% between 1989 and 2000. General Electric expected 45% of all new power generation equipment orders to come from Asia. (*Fortune* 31/10/94: 84) That Asia is currently probably the only existing market for nuclear power technology is not necessarily a good omen. According to the World Bank, Asia represents the largest potential market and consumer base for power companies well into the twenty-first century. To meet demand, it is estimated that the region will require over 2000 MW of power generation each year for a decade. (*FT* 26/9/95: Supp 1) This is only one side of a massive infrastructural development market in Asia that is expected to boom over the coming decade.[2]

By the year 2000, Asian countries were forecast to consume nearly 47% of world steel, compared with 34% in 1990. In the same period Asian steel production was expected to reach nearly 40% of world production, up from 31% in 1990. (*FT* 29/12/94: 3)

According to Sumitomo Rubber: 'The global tyre market will grow only 3%, of which Asia, including China, will grow 8 to 10%.' (*FT* 29/1/96: 13)

By the mid 1990s East Asia accounted for a quarter of world imports and licenced production of major conventional weapons, an increase of 10% over the mid 1980s. Other sources said military expenditure rose 9% between 1992 and 1994, in marked contrast to the declines in military spending elsewhere on the globe. Others estimated that military spending by Japan and the six Asian NICs (Indonesia, Malaysia, South Korea, Taiwan, Singapore and Thailand) grew from $49 billion in 1983 to $85 billion in 1993 and $130 billion in 1995. (*Obs* 11/2/96: 23; *FT* 11/10/95: 4; *FT* 28/3/96: 6)

According to the International Telecommunication Union, 'In the coming five years investment in the region's telecommunications market is expected to exceed $300 billion.' British Telecom endorses this view: 'If a telecom company wants to be a world leader, it has to be a leader in Asia Pacific. This will be the most important geographical segment by 1998.' (*FT* 9/4/96: Supp 1) More recently, Nokia, the world's largest mobile phone maker, said it still expected Asia – despite the AFC – to be the largest market for handsets in the world. (*Economic Times* 30/10/01: 17)

The value of the travel and tourism market in Asia Pacific was expected to increase at 7.8% annually from a 1985 figure of $805 billion to nearly $2 trillion in 2005. (*Time* 12/6/90: 58)

Asia also leads the world tobacco market. 1992 world cigarette sales were 5330 billion, of which 1705 billion were sold in China, 875 billion in the Far East, 75.3 billion in western Europe, 643 billion in East Europe, 555 billion in North America, 346 billion in Latin America and 139 billion in India. (*FT* 24/10/93: 8)(9)

Asia is increasing its presence in Forbes' annual list of billionaires, which in 1996 listed five Asians in the top ten of the world's richest individuals. Outside Japan the number of billionaires in Asia rose from twenty-six in 1991 to eighty-two in 1996. While Japan's tally remained at forty-one, Hong Kong weighed in with twenty, Malaysia with eleven, Indonesia and Thailand with ten each, the Philippines with nine, South Korea and Taiwan with seven, with Singapore bringing up the rear with four. (*Guard*1/7/96: 3; *Forbes* 15/7/96: 124-172) Of course, production in this area was slashed by the AFC.

Asia's booming environmental market

Asia is also leading the world in environmental destruction. Alas, while market studies abound, in the case of toxic waste, 'not only does little data exist, but virtually no hazardous waste research has been done to date. With increasing industrial activities, particularly in the electronics industry, which is booming in some of these countries, the rising volume of toxic waste poses a serious problem.' (Hilz: 22-23) Similarly, another observer notes, 'A UNEP-WHO ad hoc Working Group ... concluded in 1984 that "it is safe to say that virtually all developing countries (DCs) have yet to develop a comprehensive hazardous waste management scheme, as compared to those already established in most industrialised countries." Regrettably, some seven years later, very little improvement can be noted in nearly all DCs.' (Trehan: 125-126)

Despite this lack of data, it is undeniable that 'the petrochemicals boom in Asia and elsewhere will bring with it a boom in hazardous waste generation. Predictably there is currently an explosion of schemes to send incinerators and incineration technology from the US to Eastern Europe, South East Asia and Latin America.' (Bruno: 22) According to K F Jalal of the ADB, 'Industrial pollution has become very serious in the PRC and India, and is an issue in Indonesia, Malaysia, the Philippines and Thailand.' (*EST* 27(12): 2276)

Given this growth, accelerated development in the Asian environmental services market is expected. The American Environmental Technology Consortium in Asia (AETCA) estimated that the market for environmental technology in East Asia will grow at an annual rate of 16%. (For purposes of comparison, the US growth rate is 6% and that of Europe 8%.) The highest growth rates in this sector currently are shown by South Korea, Taiwan and Hong Kong. (*EBB* 299: 5)

In 1992 a US Department of Commerce official estimated the environmental market (excluding cleaner production) in ASEAN at $1.8 billion annually. (*EST* 27(13): 2654)

Explaining the economic miracle

Before looking at the economic explanations, we should take note of the cultural one, which attributes the miracle to 'Asian values'. These include 'attachment to the family as an institution, deference to societal interests, thrift, conservatism in social mores, respect for authority', according to Kishore Kriahbudan.

Asians also prize consensus over conflict and emphasise education. While these values are supposed to be universal, like the economic miracle, they only embrace part of Asia: 'The debate has concentrated on East Asia, largely ignoring South Asia.' (*Econ* 25/7/98: 23)

Confucianism, some cynics note, has been used to explain many different things. Under Mao, it was the explanation for the backwardness of China's peasantry. Outside the PRC in East Asia, it explains the economic miracle. Then, with the AFC, Asian values were suddenly deleterious to economic development, revealed in their true form of crony capitalism. Something which explains so much explains nothing.

The drive for consensus, claimed as a pre-eminent Asian value, seems contradicted by the area's recent history – since 1986 'the region has seen a series of mass protests: in the Philippines in 1986, South Korea in 1987, Myanmar in 1989, China in 1989, Taiwan in 1990, Thailand in 1992, Indonesia in 1998.' (*Econ* 25/7/98: 23-24).

Indeed, if Asia is so prone to embracing consensus, one can only wonder why there was any need for the strong repression of public protests and trade union activity that accompanied the miracle growth, from Japan to Indonesia to the PRC.

The reigning neoliberal interpretation of the Asian economic miracle – a simplistic 'All hail the market and the minimum state' line – is as incredible as the Asian values explanation. Repeated *ad nauseam* in much of the neoliberal literature, it is notoriously prescriptive rather than descriptive. The importance of the neoliberal interpretation of Asian economic growth is not its explanatory force but its exemplary nature. The prescription of minimum state control, export-oriented industrialisation (EOI), etc., – supposedly behind the Asian miracle – is advanced by the World Bank, the IMF and others as the only way forward for 'developing countries': this prescription has been imposed by the IMF and World Bank in their notorious Structural Adjustment Programmes (SAPs). 'Major international agencies, free market economists and other ideologists see in the experience of Pacific Asia a vindication of their models of economic development.' (*Forbes*: 50)

It is not only the developing countries that are being prescribed this imaginary miracle cure. Even declining countries in the core can benefit from it, if we are to believe the drivel being spouted by Tory Party cadres about turning England into a tiger economy. Chris Patten presents the Tory vision of 'Enterprise Britain': 'We must re-dedicate ourselves with the fervour of zealots to open markets and free trade ... Britain should become, in effect, the Hong Kong of Europe, an off-shore entrepreneurial haven, an open economy throbbing with vitality, invigorated by low taxes, liberated from government regulation.' (*Obs* 29/10/95: 3) Tony Blair of New Labour meanwhile toured South East Asia and appeared more attracted to the social authoritarianism and savings schemes of Singapore, thereby earning the approval of Harry Lee Kuan Yew, a dubious distinction for any party with 'labour' in its name.[3]

Thankfully, the orthodox neoliberal interpretation has been continually undermined of late by a series of empirical investigations of the Asian experience. One observer notes, 'To a large degree ... the NIC experience has been narrowly interpreted as an example of export-led growth. This neoliberal misinterpretation misses most of the institutional dimensions of their growth processes and encourages many would-be NICs to pursue resource and manufacturing exports, to create EPZs, to offer inducements to foreign investors, place constraints on labour organisations and wage levels, and in a variety of other ways to create an attractive business climate while failing to put into place the income and asset reform, compression of elite consumption, enforced investment and cor-

poratist state-society linkages which have contributed to the NIC success.' (Devlin: 52).

Such interpretations indicate that Asian economic development is as much a creation of state capitalism as any orthodox 'state socialist' economy. Economic development, according to these analysts, is due to the effects of Bureaucratic Authoritarian Industrialising Regimes (Cumings), or 'developmental states' (Castells), while more recent commentators have described 'developmental communities' (Zweig). These analysts point to state control of the industrialisation process, control of banking and credit systems, as well as the major involvement of state-owned enterprises in these economies.

Here it is worth quoting Cumings at some length: 'The Bureaucratic Authoritarian Industrialising Regime (BAIR) model of relative state autonomy, central coordination, bureaucratic short- and long-range planning, high mobility in moving in and out of industrial sectors, private concentration in big conglomerates, exclusion of labour, exploitation of women, low expenditures on social welfare, and, in pre-war Japan and contemporary South Korea and Taiwan, militarization and authoritarian repression, is found in all three nations ... industrial development in Japan, Korea and Taiwan cannot be considered as an individual country phenomenon, but instead as a regional phenomenon in which a tripartite hierarchy of core, semi-periphery and periphery was created in the first part of the twentieth century and then slowly recreated after World War Two ... the development "successes" of Taiwan and Korea are historically and regionally specific, and therefore provide no readily adaptable models for other developing countries interested in emulation.' (Cumings: 260)

Part of the historical circumstances that allowed the East Asian miracle to flourish were the geopolitics of the time. Following the revolutions on the Asian mainland, the US was particularly interested in building the North East Asia (NEA) economies into a bulwark against communism, providing massive amounts of aid to kickstart the industrialisation process and providing preferential access to the US market, while allowing the NEA economies to develop behind high levels of protectionist tariffs and regulations. It is notable that it was only after the threat of communism evaporated with the collapse of the state socialist bloc and the PRC's decision to take the capitalist road, that the US began to demand the dismantling of barriers to entry by MNCs into the NEA economies.

If the neoliberal interpretation is wrong, so are the simple conspiracy theories that make MNCs the causal force in east Asian development. Local firms grew along with the economy: 'The adoption of an export-oriented strategy for growth fostered, except in Singapore, domestic manufacturing firms capable of competing internationally. Despite generous government incentives, FDI dominated only a few sectors and played a comparatively small role in overall capital formation, and even in exports.' (Haggard: 85) This is confirmed by UNESCAP, which notes, 'The absolute number of TNCs in most Asian and Pacific countries is relatively small and TNCs are not the dominant source of investment.'

A more comprehensive understanding of the tentacles of capital is required to begin to trace what went on in East Asia. Loose connections such as subcontracting, licensing and OEM production were more important than FDI. Gereffi has argued that the extension abroad of Japanese subcontracting practices was the impetus for the NEA NICs, while Bernard argues, 'The diffusion of manufacturing in East Asia has increasingly been characterised by shifting hierarchical networks of production linked both backwards to Japanese innovation and forward to American markets.' (Bernard: 172)

Other analysts cite the importance of Export Processing Zones (EPZs). 'The EPZs ... played a significant part in the economic development of Asia Pacific societies such as Taiwan and South Korea, and are emblematic of an Asia-Pacific, or more precisely, Japanese model of development.' (Castillo: 69)[4]

What is unquestionable is the importance of female labour in this form of industrialisation. Standing reports: 'No country has successfully industrialised or pursued this development strategy without relying on a huge expansion of female labour. And in EPZs of many industrialising countries it is not uncommon for three-quarters of all workers to be female.' (Standing: 1080)[5] Furthermore he notes the growth of an informal out-contracting of work associated with EOI: 'Much of the employment connected with export industries, as well as others, is indirect if not concealed altogether. A very good example comes from a study in Mexico that should be replicated in many more countries. This study showed that production was organised through a complex process of subcontracting, with the labour-intensive, lower paid, more informal activities being put out to women workers, many of whom were not recorded in the workforce. This is a classic instance of "modern" production rely-

ing on what is depicted as "pre-modern", or informal labour relations.' (Standing: 1080)

A variety of miracles, with Japan as the model

There is a voluminous literature on the Asian miracle by now, some parts of it more illuminating than others.[6] Much of the literature traces the growing interdependence of the Asian economy. John Wong notes, 'Japanese economists like to portray the pattern of Asian economic growth as a formation of flying geese, with the Japanese economy taking the lead, followed by the NICs, ASEAN and China,' (Wong: 126) while Watanabe claims this development involves multilayered chasing relationships: 'In this relationship, every country in the region has been chased by another and, therefore, every country has been continuously "forced" to increase its productivity and to upgrade its industry and export structures.' (Watanabe: 153). Thus Asian countries ascend the product ladder, always with one eye on those on the rungs below them.

These flying geese have been targeted by recent critics who argue that 'not only has the pattern of industrialisation in Korea and Taiwan been dramatically different from that pursued by the original goose, Japan, but it in turn differs significantly from the current rapid growth in manufacturing exports in South East Asia. The flying geese analogy fails to note that the changing global political economy and developments in technology and production techniques preclude a homogenization of industrial structures.' (Bernard: 207)

Rather than fixing on the geese, maybe we should lower our vision to the waves they fly over. The image of waves of industrialisation is a fitting one for the industrialisation process in East Asia as these waves washed over each other. Thus in the 1950s and 1960s Japan industrialised (again), in the 1960s and 1970s the wave struck Hong Kong, Taiwan, Korea and Singapore, in the 1970s and 1980s the wave struck Indonesia, Malaysia and Thailand, and in the 1980s and 1990s the wave struck the PRC and is now dragging in laggard states like the Philippines and Vietnam. 'It became clear in 1994 that the frontier of East-Asian style growth had shifted to incorporate some inland provinces of China and Vietnam, and was stretching towards the Philippines and into South Asia,' according to a study by the Australian National University. (*FT* 2/6/95: 5)

It seems reasonably clear that there are major differences between the NEA and SEA miracles. SEA had fabulous natural resources to ex-

ploit, while their lack in NEA made economic growth there dependent on manufacturing. Similarly, while the role of the state was central in both regions, the quality and aim of state intervention were not the same. In NEA the state organised production, oversaw the growth of world-competitive firms and subordinated personal and sectional interests to national interests. In SEA the state functions more like a rentier, happy to extract rent from the exploitation of natural resources and favouring the enriching of politically well-connected firms. By comparison with NEA, few world-competitive local firms arose, and MNCs were of far greater importance in manufacturing.

It is useful to view this economic development in world system terms. The first post-war industrialisation in Asia, that of Japan, occurred with the US as the core, Japan as the semi-periphery, and East Asia and South East Asia as the periphery. Later developments occurred against a background which placed Japan at the core, East Asia as the semi-periphery and South East Asia and China as the periphery. Over the decades the periphery kept expanding and now the semi-periphery, in particular Korea, wants to enter the core.

This crude characterisation is supported by the pioneering and dominant role of Japanese capital in the spread of capital's reign in East Asia. Japan represented the model of industrialisation which was followed as closely as possible by other countries, while Japanese capital was essential for the economic development of these nations.[7] This is amply borne out by the experience of Korea and Taiwan, which both sought to develop heavy industries during the early 1970s. Cumings argues strongly for the existence of a North East Asian political economy based on the export of declining Japanese industries to its North East Asian neighbours. For the heavy industrialisation programmes to proceed, capital was needed: 'One key enabling factor was the massive re-entry by Japanese capital (loans and investments) into the Republic of Korea and Taiwan in the mid 1960s.' (Cumings: 75)

Although American economic advisers opposed this heavy industrialisation, both Korea and Taiwan nonetheless succeeded because Japan was also restructuring its industry at the time: 'The Republic of Korea and Taiwan were able to obtain needed financing and technology for these projects from the Japanese, in part because the new programmes provided the structure necessary to receive declining Japanese heavy industry.' (Cumings: 76)

Cumings sees the export of heavy industries such as metals and chemicals as part of a historical pattern in North East Asia: 'Taiwan and Korea have historically been receptacles for declining Japanese industries ... By the mid 1930s Japan had begun to export iron and steel, chemical and electro-generation industries, although much more to Korea than to Taiwan. In the 1960s and 1970s both smaller countries have received declining textile and consumer electronics industries from Japan (as well as from the US), and in the 1980s some Japanese once again speak of sending steel and autos in the same direction.' (Cumings: 46)

The centrality of Japanese capital can also be seen in the industrialisation of SEA, though it has been joined more recently by capital from the other NEA countries, and SEA has also received FDI from US multinationals, primarily in electronics and resources. The Japanese Ministry of Finance estimated that Japan invested $27.4 billion in ASEAN between 1951 and 1990. (Ward: 111) Between financial year 1988 and 1990 Japanese companies invested $11 billion in 2492 projects in Indonesia, Malaysia, Singapore and Thailand. Thailand was an especially favoured location – by 1990 Japanese companies were opening factories there at the rate of one every two and a half days. (*Econ* 16/11/91: Survey 11)

Non-Japanese capital has also been of importance in SEA. One review notes: 'Japan has been the main source of increasing direct investment in Asia. The NIEs have recently become major investors in export-oriented, labour-intensive manufacturing in South East Asian countries. Asia was the source of about 60% of direct investment in South East Asia. Apart from Japan, Taiwan with its large current account surpluses has emerged as one of the fastest-growing sources of direct investment in the region. Hong Kong was the second largest source of investment followed by Singapore and Korea.' (Kun: 28) By the end of the 1980s, 'Taiwan had replaced the US as the second most important investor in ASEAN and had overtaken Japan as the single largest investor in Malaysia. The share of the four East Asian NICs combined in foreign investment in all ASEAN countries except Thailand was comparable to or exceeded that of Japan.' (Bernard: 182)

Thus Korean and Taiwanese capital has again followed the Japanese example.

Here again we may note the difference between Japan and its NEA neighbours. It is significant that the major destination of capital from

the NICs is mainly towards Asia, in comparison with Japanese investment, which goes to both cores of US and Europe, as well as towards Asia. And when NIC capital goes to core economies, it heads for the periphery of the core – Korean and Taiwanese companies to Northern Ireland and de-industrialised England on the European periphery, to Mexico, the Caribbean, Central America and Eastern Europe – or the periphery in the core, such as the garment sweatshops of New York and Los Angeles.[8] In the latter case, Gereffi notes a recent proliferation of turn-of-the-century sweatshops drawing on migrant labour in the major North American cities. 'Many of these US plants have been set up by East Asian entrepreneurs to avoid US trade barriers and to exploit low-cost labour.' (Gereffi: 63)[9]

If NEA is characterised by the development of strong local capital, SEA remains resolutely last in Watanabe's chasing game. 'In contrast to the North East Asian experience, there is a very high dependence on subsidiaries of transnational corporations for manufactured exports; for instance, in Malaysia at the end of the 1980s, foreign-controlled companies contributed 99% of the exports of electronics, over 90% of the exports of machinery and electrical appliances, over 80% of the exports of rubber products, and 75% of textile and apparel exports.' (Bernard: 196) As Henderson notes, 'While significant manufacturing sectors have emerged in Malaysia, and to a lesser extent Thailand, this has been largely a consequence of FDI from Japan, the USA, etc., and more recently Taiwan. Domestically owned manufacturing continues to be underdeveloped.' (Henderson 1999: 338)

Here, the role of the state has been crucial. In SEA the state did not force manufacturing up the product ladder, nor did it invest in education to improve its labour force. The SEA economies 'seriously underinvested in education, resulting in secondary school enrollments in Thailand and Indonesia half or less than half those of Korea and Taiwan at the same per capita income level.' (Wade 1998: 142)

Similarly, SEA is highly dependent in terms of production technologies. There is a phenomenal difference in innovation between the two regions. 'Japan takes out more patents in the US than any other country bar the US itself. In recent years Taiwan has taken out the sixth largest number, Korea the seventh largest, ahead of the middle-ranking OECD countries like Italy, Ireland, Netherlands or Scandinavia. No other developing country comes even close.' (Wade 1999: 132) Thus, despite the delusions of Mahathir about Malaysia becoming industrialised by 2000

(or, more recently, 2020), and despite aerospace and high technology ambitions in Indonesia, none of the SEA nations is likely to catch up with NEA in the foreseeable future.

The problem with Watanabe's chasing game is that the hierarchy in the game is institutionalised. Japan will always be in the lead, notwithstanding NEA making some strong challenges, and SEA will always be at the end of the field, though constantly being chased itself as the periphery gets continually extended.

At the top of the product ladder, Japan dominates through its control of innovative technology, while the NICs strive to catch up through the creation of science parks and other attempts to gain a technological edge.[10] Yet this upgrading of industry does not remove hazard, only changes the nature of the hazard, just as incineration of toxic waste does not destroy the hazard associated with toxic waste, but simply changes the nature of the hazard by changing its form. Accelerated development leads to accelerated crisis; high-tech development leads to high-tech crisis.

The Asian financial crisis

In 1997 everything changed. From an economic powerhouse and a dynamo of the world economy, soon to lead global capitalism into the Pacific Century, Asia turned into a black hole, requiring the provision of massive IMF aid, while, in a new updated version of the domino theory, it threatened the global survival of capitalism.

One trillion dollars was wiped out in the region as a result of the crisis, according to Francis Yeoh, managing director of Malaysian construction giant YTL Corp. (*BsWk* 1/6/98: 21) As the value of Asian currencies dived, so did their stock markets. In the six months following July 1997 the currencies of Indonesia, the Philippines, South Korea, Malaysia and Thailand fell between 41% and 73% in value; in the same period the stock markets in these countries fell 64% to 84%, as measured in dollars. (*WSJ* 12/1/98: 1)

In response, Thailand, Indonesia and South Korea had to appeal to the IMF for bail-outs which came with the traditional IMF conditionalities: governments were forced to rein in spending by abandoning prestige projects, cutting social spending (such as it is) and price supports for basic foodstuffs. On the economic side, the governments have been exhorted to close down local finance houses and banks and open their protected economies to western capital.

Western commentary on this crisis has conveniently found all the fault to be Asian. Crony capitalism is to blame: the close link between Asian capitalists and the state – rather than commercial acumen – has led local bankers to loan money, particularly to those with political connections. Dazzled by their high levels of economic growth, governments in the area have pushed grandiose plans for energy and high-tech production, without adequate markets but with strong state support and subventions. This, goes the refrain, has led to massive overcapacity in many basic industries. Others claim the crisis represents no less than an end to the Japanese/Asian model of state-directed growth, leading to the global victory of western free-market capitalism, the return yet again of the 'end of history' theme.

This version conveniently locates the blame with the Asian borrowers rather than with the financial institutions and bankers that lent them money. Less attention has been paid to the folly of the core institutional investors, banks and investment funds in making available such large loans to what they now claim were dodgy borrowers. Let us look at some figures.

German bank loans to Asia increased from over $10 billion in 1993 to nearly $50 billion in the first six months of 1997; in the same period, French bank loans to Asia increased from $20 billion to $40 billion, British from over $20 billion to nearly $30 billion and US from $25 billion to $32 billion. The amount of foreign capital invested in Asian companies is staggering. 'Asian companies have gone into hock to the rest of the world to the tune of at least $700 billion since 1992, figures Josephine Jimenez, senior portfolio manager for Montgomery Emerging Market Fund. Japanese banks alone have lent Asians $263 billion, while Europeans have lent $155 billion and Americans $55 billion.' (*BsWk* 17/11/97: 40) Japanese banks are reported to have lent $23.1 billion to Indonesian and $24 billion to South Korean companies.

The obituary for the command Asian economies was a bit premature, as the two economies which have been largely unmarked by the crisis – the PRC and Taiwan – are both highly protected economies with strong control on foreign investment and ownership of local companies. Taiwan is a very closed economy, with relatively low levels of foreign borrowings and a currency with limited convertibility where capital has been mainly invested in productive machinery rather than in property speculation. Foreign investments are confined to holding 15% of the equity of any company, and total foreign ownership of a company may not exceed 30%.

The PRC is even more isolated from the control of the world markets, with its economy strongly controlled by the state and with minimal foreign involvement in its stock or currency markets.

There are strong arguments that the current crisis is due to the liberalisation of Asian financial markets in response to western demands. Mark Atkinson argued in the *Guardian*, 'If Thailand had not attracted so much footloose foreign capital, it would not have run into the difficulties which ultimately brought the economy to its knees and sparked the whole Asian crisis.'

In an excellent analysis, which emphasises that what we are seeing is a crisis of the South East Asian, rather than East Asian, economies, Walden Bello locates the cause of the current crisis in the flood of finance capital into South East Asia in the last few years, which mainly went to 'fuel asset inflation in the stock market and real estate.' Real estate development was a major consumer of bank lending. 'As a percentage of commercial banks' total exposure, real estate or real estate-related loans came to 15 to 25 percent in the case of the Philippines and 20 to 25 percent in the case of Malaysia and Indonesia. In Thailand, where the exposure in real estate was grossly underestimated by official figures and calculated by some to come as high as 40 percent of total bank loans, half of the loans made to property developers were said to be "non-performing" by early 1997.' (Bello: 14) Furthermore, inspired by the notion of easy money, many manufacturers gambled their profits in the stock market and on real estate, rather than reinvesting them in upgrading technology and skills. As Bello concludes, 'Unchecked by any significant controls by governments that had internalised the IMF and World Bank theory about the self-correcting mechanisms of the financial market, the frenzied flow of capital had led to the creation of a giant speculative bubble over the real economy that would explode in a highly destabilizing fashion.' (Bello: 14)

The knock-on effects of the crisis have been due both to the panicked stampede of finance capital out of Asia and the rescue efforts of the IMF, in particular in regard to Korea, where it was 'in danger of turning a severe crisis into an outright recession'. (*ACN* 19/1/98: 10) As Jeffrey Sachs observed, 'There are no fundamental reasons for South Korea's calamity except for financial panic itself.' (*ACN* 19/1/98: 10) South Korea, according to one analyst, 'does not have serious macroeconomic imbalances. Its problem is of corporate and foreign exchange liquidity, brought about in large part by fickle markets guided by economists at investment banks and by

rating agencies which follow the sentiments of the crowd rather than applying consistent principles. The crisis says more about fragile international capital markets than about Korea.' (*IHT* 17/12/97: 8)

The same analyst points out that the Korean government has long discouraged foreign borrowing by the private sector, which it was unable to control after the liberalisation it had been persuaded to undertake. The spending splurges undertaken by the Korean *chaebol* (conglomerates) occurred despite opposition from government planners, who had lost their ability to discipline the corporate sector when control of credit was removed from the hands of the state. According to the Vice-Minister of Trade and Industry, 'We've lost the ability to regulate capacity. It is impossible to tell them to cut back.' (*BsWk* 10/11/97: 27)

A similar point may be made in regard to foreign debt in South East Asia: the vast majority of it is private, rather than public.

Despite the centrality of private debt to the crisis, the IMF in its wisdom has continued to focus its activities on the state rather than private debt. In Indonesia, the focus of the IMF's intervention was the state's $16 billion budget for 1998, rather than the $80 billion private debt that caused the crisis. The IMF, for example, demanded that the Indonesian government disband Bulog, the state organisation that controls the distribution and price of certain staple foodstuffs. It is hard to see how this will affect the capacity of private Indonesian companies to pay their dollar debts.

The IMF has also been attacked for pushing a line which is to the advantage of western capital, without any guarantee that it will actually deal with the crisis. With its demands for the removal of state controls and liberalisation of the economy to allow western capital to control local companies, the IMF appears to be acting as the vanguard of western capital.

In the case of Korea, it has been publicly suggested that the IMF has a motive other than returning the country to economic stability. 'It has an agenda which goes much deeper than dealing with the crisis,' according to an ING Baring analyst. 'The IMF wishes to dismantle the *chaebols*, fix the banking system and break the connection between government and business.' (*ACN* 19/1/98: 11)

Needless to say, what is crisis for some is an advantage for others. The financial crisis provides western capital and its tools with a lever to

wedge open the Asian economies to western control. The problems caused by this cash crisis have left local companies vulnerable. One Indonesian brokerage estimates only twenty-two of the 282 listed Indonesian companies have adequate cash flow, while Credit Lyonnais estimates only eighty-seven out of a total 653 listed non-financial firms in Korea are relatively safe from predators. (*FT* 12/1/98: 4) TNCs are expected to move in to pick up assets at rock-bottom prices from companies which are desperate for cash.

According to a recent report by Political and Economic Risk Consultancy, 'The coming year is likely to be marked by a massive move towards recapitalization of both Asian-owned banks and the companies to which they have lent, and the major way that this recapitalization will take place is by converting debt to equity. A large part of the workout will involve foreign companies and banks taking equity stakes in these troubled Asian banks and enterprises.' (*IHT* 7/1/98: 4)

Interestingly enough, this massive transfer of resources did not take place, or at least not on the expected scale. Merger and acquisition (M&A) deals in Asia Pacific rose to $87 billion in 1999 from $59 billion in 1998, yet M&A specialists report the breakdown of deals handled as 40% in-country M&As, 40% cross-border deals within Asia and only 20% MNCs buying into Asia. 'You would think the multinationals would have been more active than they have proven,' noted one specialist. (*FT* 28/4/00: Supp2)

If one reason for this was Asian reluctance to sell, another was the early recovery the region experienced. In April 2000 the ADB estimated the region's economies would expand 6.2% in 2000, the same rate as in 1999 and treble that of 1997. 'In less than two years, Asia's industrial production has returned to the levels seen before currency turmoil in mid 1997 triggered an economic crisis.' (*IHT* 27/4/00: 15) Similarly, foreign portfolio investment in the region recovered from a low of $5 billion in 1998 to under $20 billion in 1999 and over $20 billion in 2000. (*FT* 22/2/02: 21)

If one motor of recovery was state spending (*BsWk* 13/8/01: 24), it is the continuing growth of the PRC that has restored the lustre to the area, with the PRC now the subject of the same language, aspirations and expectations as the Asia Pacific previously was. 'China is the potential opportunity of a lifetime,' according to the president of Kodak Asia. (*BsWk* 16/4/01: 43). The new Chinese industrial machine is 'an unstop-

pable force', according to the CEO of Flextronics, the contract-manufacturing giant. (*BsWk* 22/10/01: 40) For an MNC, according to McKinsey & Co, 'You have to have a major manufacturing presence in China, because if your competitor isn't there yet, they soon will be.' (*Fortune* 4/3/02: 59) So the wheel continues to turn.

The public secrets of the economic miracle

Most of the congratulatory and panegyric literature about the Asian economic miracle has been astonishing, not only in its incorrect depiction of it as a triumph of the free market, but also in its failure to mention many of the most basic aspects of this form of economic development. Here again, what is interesting about these depictions is what they exclude. This does not just involve the geographical exclusion zones mentioned above. It is amazing how many paeans to East Asian industrialisation have failed to mention how South Korea and Taiwan, for example, were military dictatorships while this miracle was underway.

Despite their disagreements as to the reasons behind the success of the EA model, both sides of the debate agree that EA economic development is a model. Yet as this book will show, the miracle was a tragedy for the Asian peoples and environments it gobbled up on the way to model status. What becomes clear is that the industry/state nexus that characterises the Asian model, in both its NEA and SEA variants, is toxic, both in the sense that it destroys life and in the poverty of the consumerist life-style that it offers as a reward. Here Japan exemplifies the dead end in which this particular model is stuck, not only in the recent paralysis of its economy but in the poverty of Japanese everyday life, the concreting over of its land and its vampire-like appropriation of the food supply and resources of other nations.

The greatest public secret is how based in death these economic miracles were. Many of the laudatory commentators on Asian economic dynamism have seen fit to fail to mention that this growth typically occurred under martial law conditions, preferring instead to mention only the area's supposed 'Confucian culture'. Thus Taiwanese economic development was founded on the corpses the invading Kuomintang (KMT) made, while Korea's model of industrial relations involved the use of the Korean CIA. In Indonesia, economic development progressed over the dead bodies of some hundreds of thousands of Indonesians, and continued with its near-genocidal occupations of East Timor and West Papua. These ghosts waft around the origins of this model of industrialisation.

This book attempts to examine the dirty underside of the Asian economic miracle, another aspect strangely unremarked by economic commentators and ideologists. Just as the marvels of computer technology depended on the dirty side of the chip – whether production was in Silicon Valley or South East Asia[11] – so the results of Asian industrialisation have inevitably been the asphyxiation of the societies and countries transformed so miraculously.

The Asian industrial miracle has been strongly attacked for its super-exploitation of labour particularly of female and migrant labour. While this has been a constant theme of critical versions of this economic development, less attention has been paid until recently to the endemic environmental crisis that has accompanied the Asian miracles.

Mapping toxic Asia

This book illustrates the toxic nature of Asian industrialisation by examining in particular the growth of the chemical and petrochemical sectors. The toxic nature of Asian industrialisation is not confined to the chemical and petrochemical industries, but is strongly exemplified by these industries. While centred on the petrochemical industry, we will also look in passing at other industries strongly dependent on toxic chemicals, including electronics and textiles, toys and plastic products.

The petrochemical industry is used as a focus of inquiry into issues such as occupational safety and health, toxic waste and other toxic emissions, air and water pollution, state regulation of industry, growth of popular opposition and the strategies of state and capital to deal both with the environmental crisis and the popular opposition that results from it.

I hope to demonstrate how toxic development is as essential to the Asian economic miracle as the super-exploitation of migrant female workers, military rule, suppression of unions and other political organisations, control of information and censorship, subcontracting and the other less celebrated characteristics of Asian industrialisation.

The next chapter examines petrochemical production and consumption in the region which is being touted as the last great market for the chemical industry. The following country chapters recount the experiences of industrialisation and popular opposition on a national basis, emphasising the development of the petrochemicals sector and attempting to place this development within the development strategies followed by the state. These chapters critically examine the varying stories of eco-

nomic development in the area, beginning with NEA, continuing with SEA, and ending with the two major semi-autonomous economies of the PRC and India, which are currently being integrated, in different ways, into the world economy. The final chapter brings together the common elements of this industrialisation and illustrates a pattern of industrial development and consequent environmental destruction across Asia, orchestrated by strong states and (both) multinational and local – including state – capital.

Notes

(1) See *Foreign Affairs* 73(6): 62-78; NEBR Working Paper 4680 and European *Economic Review* 38 (3/4): 964-973

(2) For details of the Asian infrastructure market, see *Fortune* 31/10/94: 83-90; *BsWk* 28/11/94: 40-50; *Econ* 26/2/94: 70

(3) For Tony Blair's journey through Asia, see *Guard* 9/1/96: 3; 18/12/95: 4; 8/1/96: 1,6; 5/1/96: 10. For the Tories, see the *Obs* 29/10/95: 13. Dan Atkinson sees the presentation of the Pacific Rim as a form of new orientalism going through three phases in England: in the first phase, lasting to the mid-seventies, East Asia was seen as the source of goods below English notice; the second, coinciding with Thatcherism, saw East Asia as the epitome of *laissez-faire* capitalism, centering on Hong Kong; the current phase presents East Asia as a competitive nightmare. (*Guard* 7/8/95: 14)

(4) On EPZs see also Shoesmith, D (1986) *EPZs in five countries*, Asia Partnership for Human Development; ILO (1988) *Economic and social effects of multinational corporations in EPZs*; ICFTU (1996) *Behind the wire*; Lee, E (ed) (1984) *EPZs and industrial employment in Asia*, ILO.

(5) On the importance of female labour see Horton (1996), Ward (1990), Nash, J (ed) (1983), *Women, men and the international division of labour*, SUNY Pr; ILO (1985) *Women workers in multinational enterprises in developing countries*, ILO; Salaff, J W (1990) 'Women, the family and the state' in Stitcher, S (ed) *Women, employment and the family in the international division of labour*, Macmillan, pp.98-136; Haruji, T (1984) 'Asian women as victims of expansion', *AMPO* 16(1/2): 60-81. For specific industries see Chapkis, W (1983) *Of common cloth*, Transnational Institute; Women Working Worldwide (1991) *Common interests*, Black Rose Pr. See also Hancock, M A (1980) *Women and transnational corporations: a bibliography*, East-West Centre.

(6) The literature on East Asian growth has been as miraculous in its growth as its subject. Henderson is an excellent (and short!) refutation of the neoliberal orthodoxy, Cuming's description of the North-East Asian political economy is convincing, while Steven is illuminating on the central role of Japanese

capital in Asia, which he correctly denounces as an instrument of Japan's new imperialism.

For those wishing to present an ethnic interpretation of east Asian success (it's the overseas Chinese, stupid) see Hodder, R (1996) *Merchant princes of the East*, Wiley; Weidenbaum, ML and S Hughes (1996) *Bamboo network*, Simon and Schuster; Seagrove, S (1996) *Lords of the new Rim*, Corgi; *Fortune* 31/10/94: 40-68; Canberra: EA Analytical Unit, Dept of Foreign Affairs (1995), *Overseas Chinese business networks in Asia.*

(7) On the importance of Japanese capital see Cumings; Steven; Hatch, W and Yamamura K (1996) *Asia in Japan's embrace*, CUP; Healey, D (1991) *Japanese capital exports and Asian economic development*, OECD. For individual countries see KS, J (ed) *Japan and Malaysian development*, Routledge; and Castley, R (1996) *Korea's economic miracle*, Macmillan.

(8) For Korean investment in the English periphery see *FT* 14/2/96: 8; 6/3/96: 4; 10/7/96: 1,20,7; 11/7/96: 9; *Sunday Times* 17/3/96: 2.6; 13/10/96: 2.9; 14/7/96: 2.1; 16/6/96: 2.1; for EA investment in the 'transition economies' of east Europe, see *WSJE* 13/6/96: 1,9; *BsWk* 7/10/96: 29; OECD (1994) *New economic partners*, OECD. For investment in Latin American *maquiladoras* see *MM* Dec92: 30-33; Jan93: 30-32; *NI* Aug93: 8-10. For investment in forestry in Latin America see *WSJE* 13/11/96: 1,7; *Guard*29/6/96: 15; *Ecol* 24(2): 45-52; NACLA Report on the Americas 29(3): 7-9.

(9) On this see Um, S J (1996) *Korean immigrant women in the Dallas-area apparel industry*, U P America; Ong, P (ed) (1994) *Asian immigration in Los Angeles and global restructuring*, Temple UP.

(10) See Castells, M and P Hall (1993) *Technopoles of the world*, Routledge, and Simon, D F (ed) (1994) *Emerging technological trajectory of the Pacific Basin*, M E Sharpe.

(11) Useful sources on the dirty side of the electronics industry can be found in Siegel, L and Markoff, J (1985) *The dark side of the chip*, Harper and Row; International Journal of Health Services 16(1): 105-120; San Francisco Regional Water Quality Control Board (1985) 'Assessment of contamination from leaks of hazardous materials in the Santa Clara groundwater basin' *Technology Review* 87(4): 24-33.

2

Petrochemicals

Infrastructure for toxic industry

Following the Second World War, the use of highly complex synthetic chemicals became of crucial importance to industrial production. Within this period, industrial and agricultural production and processes, the production of food additives, fuels, fabrics, construction materials, fertilizers, drugs and pesticides became dependent on the use of chemical technology. Synthetic textiles and plastics were developed, as was the use of nuclear radiation for power and weapons production.

Thus, if the first wave of industrial production involved mechanical engineering and the development of the factory system, the second wave saw the increasing use of chemical and other process technology. According to the OECD:

'The importance of chemicals in modern societies cannot be denied. The twentieth century has witnessed a chemical revolution which has led to the integration of chemicals into all aspects of everyday life. It is a revolution which has transformed our physical surroundings and has changed our food, our medicines, clothing and construction materials.

'Indeed it is often difficult to identify manufactured articles which do not incorporate chemicals unknown or in limited use before the turn of the century. More than 50,000 chemicals are in current commercial production and a thousand new chemicals or more are introduced each

year. They are produced in volumes which range from less than a tonne up to million of tonnes a year. In many cases they are essential inputs to production processes in other sectors of industry.' (OECD: 13)

The introduction of chemical technology, with its related work processes, was a great leap forward for capital in terms of productivity, profitability and removing control over the work process from the hands of workers, but it proved to be a leap into the abyss for the public at large. This massive spread of the use of chemicals has resulted in an increased exposure through all stages of what may be called the toxic cycle (though it is no more a complete cycle than the nuclear cycle). This exposure occurs through mining/extraction, refining, production, transportation, consumption and waste disposal. While the production of chemicals has fallen from its original astounding growth rates, the global threat it poses continues to be massive: 'A low growth scenario of 3.5% per annum would lead to a doubling of chemical production over the period 1980-2000, and a potential increase of associated hazards.' (OECD: 29) More recently, the OECD estimated that in the year 2020 global output of chemical manufacturers will be 85% higher than in 1995, with production value growing from $2.66 trillion in 1995 to $4.92 trillion in 2020: these figures include plastics and rubber. (*CEN* 30/4/01: 11)

Plastics had the highest growth rates in the OECD from 1963 to 1988 at 7.9% per annum; electrical machinery, the second highest growth rate, at 6.1% per annum, followed by industrial chemicals with 5% and other chemicals with 4.7%. (Saunders: 25)

The toxic nature of its work processes and products has become the most important characteristic of certain sectors of production. Capital earned massive profits in these sectors by ignoring the social costs of toxic production and consumption – costs which were borne not only by workers at the point of production but also by the general population.

Of the chemical industry sectors, the petrochemical industry is central.[1] According to the ILO, the petrochemical industry now supplies over half the world's chemical manufactures, while the OECD noted that 'petrochemicals accounted for the bulk of organic chemicals production.' (Oman: 111) In the petrochemical industry the major plastics are high-volume products: 'Well over half of the world output by weight of the world petrochemical industry is in the form of plastics and resin (mainly derived from ethylene and propylene) and more than three-quarters is accounted for by this broad group together with synthetic fibres and syn-

thetic rubbers.' (Chapman: 23) The OECD estimates that thermoplastics account for 55-60% of petrochemical output. (Oman: 111) There are five major thermoplastics – polyvinyl chloride (PVC), polystyrene (PS), polypropylene (PP), low-density polyethylene (LDPE) and high-density polyethylene (HDPE).

For the synthetic fibres 'the principal synthetic fibres are polyester, polyamide (nylon 6 and 6,6), acrylic and polypropylene, the four fibres being in some markets complementary and in others highly competitive ... the four fibres ... together account for 98% of world production.' (*C&I* 3/10/94: 755)

Petrochemicals in Asia

Industry analysts have spoken of chemicals in Asia in apocalyptic tones. Paul Dreschler of ICI claimed the growth of chemical production in the Asia Pacific and accompanying changing global patterns of trade and income will result in a chemical industry in the twenty-first century which is likely to be unrecognisable from what it is today. By the year 2020, Mr Dreschler estimated, the Asia Pacific chemical market is likely to be even larger than the markets of North America and Europe combined. Currently Asia runs a trade deficit with western Europe ($9.5 billion) and North America ($17.3 billion) but with the current and expected increases in chemical capacity in Asia, Mr Dreschler estimated the region will be a net exporter in 20 years. Evidence for this can be seen in the growing penetration of world markets by mainly Japanese, Korean and Taiwanese chemical companies. (*CMR* 1/4/96: 3,18) 'The extent and pace of change is about to accelerate and for the next 25 years will be at an awesome rate,' Mr Dreschler said. (*ECN* 1/4/96: 6)

These predictions were based on the increasing importance of Asia in chemicals demand. By 1992 the eleven non-communist countries of the Asia Pacific Rim (Japan, South Korea, Taiwan, Hong Kong, Australia and the six ASEAN countries) were responsible for a third of world demand for petrochemicals and plastics. This was expected to rise to 40% of world demand by the year 2000. (*Econ* 13/3/93: 26; *ChWk* 12/2/92: 20)

In February 1991, a Chem Systems study estimated that demand for petrochemicals in East Asia would grow two to three times faster than world demand. The area then consumed 50-75% of world trade in chemical products. (*CMR* 25/2/91: 9)

Much of this demand is currently satisfied by imports. In 1992 American exports of chemicals and related products to Asia – excluding Japan – were worth $8.2 billion, nearly 14% of US chemical exports. If Japan is added to Asia, nearly 33% of American chemical exports were involved. (*CMR* 14/6/93: SR18)

This growth in demand was expected to be led by China, where per capita consumption of ethylene was only 2.3 kilos in 1991, compared with 46 kilos in Japan. The Asian market in general is seen as still highly undeveloped. Per capita demand for plastic products was 5 kilos in Malaysia, Indonesia and Singapore, 3 kilos in the PRC and around 1 kilo in India, compared with 70 kilos in the US. (*CMR* 14/6/93: SR18) World per capita consumption of polyurethane is 0.8 kg, while in India it is only 0.02 kg. (*BsIn* 1/3/93: 36)

Speaking in 1994, Hiromasa Yonekura of Sumitomo Chemical, citing a MITI study, estimated that growth in demand for petrochemicals in Asia would slow to 7.3% for the next five years, down from 15.5% for the previous five years. The highest growth rate, at 10.3%, was expected in the PRC, followed by 8.5% in India, 8.4% in ASEAN, 5% in Korea and 3.9% in Taiwan. (*CMR* 5/12/94: 7,14)

Supplying the demand

In response to this demand growth, massive capacity building was planned. In 1992 Edward Delboy of Shell said the difference between the Asia Pacific and European markets was shown by estimates that up to 30 new ethylene crackers could be required in Asia by the year 2000. Delboy estimated ethylene demand in Asia Pacific could exceed 24 million tonnes by 2000, rising to 29% of global consumption from its 1990 level of 24%.

Delboy forecast that up to 12 million tonnes of new ethylene capacity would be built in Asia Pacific between 1990 and 2000, an increase equal to two-thirds of current European capacity. (*CMR* 28/9/92: 7,48)

Similarly, in 1993, Chem Systems estimated East Asian chemical output would increase over 10% annually for the rest of the decade. By the year 2000, due to rapid economic growth, East Asia's demand for petrochemicals would have surpassed that of western Europe and approached that of the US. East Asian growth in production was expected to resume after 1995, with Taiwan, Singapore, Malaysia, Thailand and India each adding new petrochemical facilities. (*CMR* 9/6/93)

Table 1: Ethylene capacity in Asia

Country	*1989*	*1999*	*% change*
PRC	1650	4168	153
India	243	1795	639
Indonesia	0	550	n.m.
Japan	5628	7639	36
Malaysia	0	550	n.m.
Singapore	400	937	134
South Korea	505	4690	829
Taiwan	953	1500	57
Thailand	315	1868	493
Japan	4066	16058	295
Total	9694	23697	144
Total-Japan	4066	16058	295

(n.m.= not meaningful) (Source: *CEN* 7/6/99: 19)

This increase in capacity reflected recent changes in the structure of the Asian chemical industry which reflect the slow decline of Japanese hegemony over the industry. Japan 'has lost its majority status in many petrochemical products ... other East Asian countries now account for 54% of ethylene production in the area, whereas five years ago they accounted for 41%. Meanwhile 60% of the polyolefins production is now outside of Japan, 63% of PVC and 47% of styrene, having grown from just 27% five years ago.' (*CMR* 29/3/93: SR14)

This challenge is not only to Japanese capital, but also to US and European capital. Growth of the local industry will involve a challenge to US and European dominance of market segments also. Lehmann Brothers noted: 'Rising capacity in East Asia means that a class of up-and-coming petrochemical makers, notably in Singapore and South Korea, are likely to wrest control of the region's petrochemical market from the US and European chemical companies that have long dominated major segments of the local business.' (*CMR* 29/3/93: SR14) The challenge involves major capital investment in local plants, with massive increases forecast in local petrochemicals production.

By 1991 East Asia, excluding Japan, had about 10% of the world's ethylene capacity. By 1996, according to a MITI study, this should increase to 12%. The PRC has given approval to seven new ethylene crackers of fourteen proposed. Singapore plans to spend $3.7 billion doubling its capacity, while Malaysia is planning its first ethylene cracker. (*Econ* 13/3/93: 30) Thus the growth in the petrochemicals industry is not only in North East Asia but is also spreading to South East Asia.

Production was mainly intended to support fast-growing end markets, operating as import substitution (IS). But of necessity these complexes were world-scale, and with the likelihood of eventual overcapacity in the region, exports represented a threat to the traditional markets of western chemical MNCs. To begin with, however, exports were targeted at voracious local markets. The Asia Pacific was reported to be the fastest growing plastics exporting region in the world with commodity polymer exports up 31%, most of it shipped locally. (*CMR* 10/6/91: 5)

The multinationals move in

In response to this threat to their export markets, western chemical MNCs began to move into Asia. MNCs such as Du Pont, ICI, GE Plastics and BASF have set up regional headquarters in Singapore and Hong Kong, where previously they would have had only branch sales offices. Similar proof can be found in the continuing announcements of planned investment in production in the area by chemical multinationals from core countries.

British companies: Tony Rogers, ICI's Asia/Pacific executive director, told *Chemical Week*: (12/2/92: 20) 'It is undeniable that for ICI, and for much of the world, the 1990s will be the decade of Asia-Pacific.' Between 1988 and 1991, ICI spent $400 million to increase capacity in Asia. (*FT* 10/11/92: 4) Both *BP* Chemicals and Royal Dutch/Shell announced in February 1994 that they intended expanding operations in Asia. (*CMR* 21/2/94: 22)

US companies: Du Pont also has major plans. The company's Singapore managing director said, 'Over the next five years we see our market in the Asia Pacific area growing at twice the rate of anywhere else.' (*FT* 29/3/93: SuppIV) Du Pont said it intended to invest $2 billion in the Asia Pacific region by 2000 to increase its nylon capacity there. (*Econ* 13/3/93: 30; 16/11/91: Survey11) In 1993 the leading chemical industry journal reported, 'During the 1990s Du Pont plans world-class

facilities in the Asia-Pacific region for its engineering resins, fibres, agricultural products and chemicals businesses.' (*CMR* 5/4/93: 5)

Other US MNCs which announced significant investment in the 1990s include Dow, Eastman, W R Grace, Amoco and Monsanto, which announced in July 1992 plans to build a $150 million joint venture ABS/SAN complex in Thailand. According to Monsanto's plastics division vice-president, 'This joint venture is one of our most significant investments in the last decade. The venture considerably enhances Monsanto's ABS and SAN positions in the world's fastest growing plastics market.' (Despite its significance to Monsanto, it will provide only 250 jobs.) The advantages of the Thai location include the fourth lowest wages in the world and government incentives for building the plant there. Monsanto hopes this move will increase its share of the Asian ABS market from 10% to 15%. (*CMR* 13/7/93: 3)

This yankee chemical rush results from the fact that US chemical investment in Asia Pacific has been minimal so far: 'According to the CMA (Chemical Manufacturers Association), less than one-tenth of one percent (0.01%) of total US foreign direct investment has gone to China, and only about 3% to all Asia-Pacific nations other than China.' (*CMR* 22/5/94: SR4) The industry is making up for lost time: recent industry sources note high investment by the US chemical industry in the Asian NICs. The US CMA outlook document for 1995 and beyond reported member companies intended continuing the established trend of shifting production abroad. Larger companies – those with chemical sales over $1 billion – expect the percentage of plant and equipment (p & e) investment in the US to decline from 80.2% in 1992 to 72.6% in 1994 and 64.8% in 1999. The CMA observed, 'These declines ... are consistent with the continuing "globalisation" of the industry and the growing need to produce in foreign markets to be competitive in those markets.' The third favoured location for p & e investment was China, second was western Europe and the most favoured were the four East Asian NICs – Hong Kong, Taiwan, Singapore and Korea. (*ECN* 17/4/95: 8)

German companies: The major German companies are also building up their operations in Asia. Bayer, which already manufactures in Japan, Malaysia, Thailand, Indonesia, the Philippines and Korea, moved into the PRC in 1994, and the following year announced that it planned to spend over $1 billion in Asia by 2000 to create a broader manufacturing base there. (*CMR* 7/3/94: 9; 16/1/95: 3)

Hoechst's chairperson toured the Far East in October 1994 for talks with potential partners in the area. Speaking in Tokyo he said his vision of Hoechst's future involves a change in perspective as to how it does business globally. Hoechst strategy for Asia involves building up 'business and assets faster than the regional market is growing', with a short-term aim to 'double our sales and asset base over the next five years, to at least 20% of the group total.' (*ECN* 24/10/94: 8)

French companies: Similarly the flagship of the French chemicals industry, Rhone-Poulenc, was planning major investments in Asia. (*FT* 22/12/93: 3) Elf Atochem is moving into Asia as well, producing PS in Singapore and plastic additives in the PRC. Elf Atochem vice president Arsene Schun said, 'We want to set up in Asia a base that will be practically as strong as our US base.' Elf Atochem's main customer base is in the electronics industry, including Phillips, Sony and Matsushita. These companies operate both in Europe and Asia, so Atochem hopes relationships formed in Asia will spread to Europe to help the company's European operations rebound: 'Our move to Singapore will help our industrial investments in Europe,' pointed out Schun, who insisted that the new unit should not be put under the heading of 'relocation'. (*ECN* 25/10/93: 12)

Industrial gas suppliers: As the chemical companies have moved in, so have chemical services and infrastructure companies. In the industrial gas supply sector, BOC had moved as a producer into every accessible Pacific Rim economy by 1989. (*CMR* 5/6/89: 9) Similarly, Praxair aggressively expanded in Asia, involving itself in joint ventures in China and Indonesia. (*CMR* 24/8/92: 40)

Transport operators: Following the industrial gas suppliers are the transport terminal operators. The three leading world operators, GATX of Chicago, and Dutch-based Van Ommeren and Paktank, are expanding their Asian operations. GATX already operates three terminals in Japan and one in Singapore, and is considering projects in the PRC, South Korea, east Russia and Malaysia. GATX is also building a deep-water jetty at Jurong Town and has added 20,000 cubic metres to its terminal, and is planning another 9000 cubic metres in 1994. (*ECN* 25/10/93: 14-16) Van Ommeren is the largest tank storage operator in South East Asia.

Paktank announced plans for a 100,000 cubic metre oil terminal at Xiamen, China, just north of Taiwan. 40% of the venture will be held by Paktank, 20% by a Hong Kong company and mainland Chinese inter-

ests will hold 40%. The company's other venture is at Mab Ta Phut in Thailand, a 50:50 venture with NPC. (*ECN* 1/11/93: 11)

Process contractors: Also moving into the Asian markets are US and European process contractors who have noted that the big jobs for the near future are in Asia. Of an estimated $103 billion market for oil refining and petrochemicals contracts for 1995 to 1999, according to contractor M W Kellogg, almost half ($48 billion) was in Asia, followed by Europe and the Soviet Union ($16 billion), North America and the Middle East, South Africa and Africa ($14 billion) and Latin America. ($11 billion). 'Asia is the world's largest hydrocarbon construction area,' according to Kellogg vice president Robert Timmons. (*ACN* 21/8/95: 11)[2]

Hazards export?

The reigning critical interpretation of this behaviour is the hazard export theory which sees the development of industrial hazards in peripheral countries as principally due to the relocation policies of multinational corporations (MNCs) from core countries. This analysis is advanced by Greenpeace, for example, which has placed much resources into combating the international trade in toxic wastes, and has also criticised the export of the chlorine industry and incineration technology to peripheral countries.

The hazard export theory originally advanced by Barry Castleman proposed that wide sectors of industry would transfer production from developed countries (mainly the US) due to continually increasing environmental costs and difficulties in obtaining sites due to community opposition. The theory was built on sound evidence of dumping of pharmaceuticals, pesticides and consumer products in peripheral countries after they had been banned in the US,[3] but has yet to be shown to be true except in limited cases where industrial production is concerned. In certain cases such as asbestos and textile dyes involving benzidine, the facts are convincing but no wholesale export of industrial sectors has yet been shown to be due to increased environmental regulation. Furthermore, such evidence as has been gathered regarding industrial operations in peripheral nations shows MNCs' operations to be cleaner than local operations; of course, this is not difficult.

The most obvious example of hazard export currently is provided by the export of hazardous waste. Here the facts are indisputable: since the crisis in waste disposal in the core countries, there have been innumerable successful and unsuccessful schemes to export waste from core to

peripheral countries. Asia provides specific instances. The export of waste to Asia was highlighted first in North East Asia with the export of metal waste to Taiwan, widening to include China when problems surfaced in Taiwan. Following this, Greenpeace began to document export of waste to South East Asia, especially of plastic waste to Indonesia. When that outlet for waste disposal was cut off, the waste trade headed for Vietnam and then South Asia.

There is no question that the trade in waste is a crime, and one that environmental groups in core countries should pursue with vigour. Whether it should be a main concern of environmental groups in peripheral countries is another question. Even on a factual basis, imports of toxic waste are small compared to local generation. My own belief is that the hazard export issue simplifies what is a more complex picture, and often loses sight of the main enemy, which is not over the seas but here at home, locally or nationally. Local production of hazardous waste is a much more important issue for activists in peripheral countries, as indeed, I would argue, is the setting up of the industry responsible for much of the toxic waste production, not just the chlorine industry, but the chemical and petrochemical industry as well.

This is not to deny the existence of hazard export. Again and again examples of this practice will reappear in this book. But sometimes the direction of the export seems problematic, as when Taiwanese capital heads to the US, because it is easier to set up a petrochemical complex in Texas than in Taoyuan. The other immediately aberrant example of hazardous waste import is provided by England, the nuclear dustbin of the world and a significant importer of toxic waste for treatment and disposal, including incineration. And while there was significant export of chemical and metals production by Japanese companies, most chemical production was retained in Japan. Similarly, the recent rush to invest in chemical plants in Asia by American and European MNCs is indeed a rush, but one that resulted from failure to invest in Asia previously.

Finally, evidence shows that such MNC chemical factories as have been set up in Asia were not set up to primarily supply products to the MNCs' home countries. Studies have shown the destination of the products of US and Japanese chemical subsidiaries in Asia: no less than 85% are produced for the local market, while exports to the home country never exceed 10%.

Behind the rush

The reasons behind this rush into Asia by the multinationals are clear. 'Mr Schneider (Bayer CEO) says simply that Asia will decide who the dominant industry players will be in the years to come.' (*WSJE* 29/7/94: 1)

The reason chemicals producers have to go to Asia is that their markets and customers have moved there. Traditionally the Asian market was served by exports from European and North American plants, a safety valve that bled off overcapacity in core countries. With the growth of a strong indigenous chemicals industry, European and US companies can no longer expect their export market to be safe from local competition.

There is also the fear of serious competition in the global market from Asian chemical companies in the coming decade. According to Mr Schneider, 'A combination of lower costs and modern technology will enable them to become exporters to other parts of the world. Asia's share of world exports of organic dyestuffs grew between 1982 and 1991 – just one decade – from 13% to almost 24%.' European companies hope to remain competitive by shifting production to Asia: this is 'a trend in the European chemicals industry as it refines its global strategy, shifting bulk chemicals capacity from the industrial centres of Europe to the rapidly expanding economies of Asia.' (*FT* 31/5/94: 14)

Cost/competitive advantage

There are also cost advantages: 'In the US the average cost to a company per worker per year is approximately $18,000; in Europe, it's in excess of $30,000, fully loaded, meaning with all of the welfare benefits. By contrast the average worker costs a Chinese firm about $1000 a year, and in India it would be in the region of $1500 per year,' according to Dr Richman of Richman Chemical. Furthermore, 'investment requirements are lower for comparable production units, sometimes 30 to 40% lower.' Other advantages include cheaper hardware costs and lower standards for environmental compliance. (*CMR* 30/8/93: SR30)

It is useful to put these labour cost benefits in the context of decision-making in the petrochemicals industry. Indeed the *Financial Times* reports that all has not been plain sailing and savings for multinationals investing in Asia: 'The region's inadequate infrastructure can almost double initial investment costs. In Indonesia, where *BP* Chemicals has built a polyethylene plant, "investment costs have been significantly

higher than they would have been for a European plant," says Mr Mike Bazzacott, chief executive of the polymers and olefins division. More than 40% of the $450 million investment was spent on roads, a jetty, houses and other amenities.' (*FT* 27/10/95: Supp2)

Some further indication of the cost advantage is given by John Akitt of Exxon who called for Asian countries to sign GATT to work out trade, environmental, government competition policy and intellectual property issues. Akitt indirectly admitted East Asian countries have a competitive advantage due to lack of environmental standards: 'A trade agreement, Mr Akitt claims, would also bring environmental benefits by promoting participation by Asian economies within the framework of a multilateral trading system which would set a uniform environmental standard. He said that the possibility of trade and market distortions necessitates that Asian countries "move collectively towards the development of sound, scientifically-based policies and standards in the environmental area."' (*CMR* 11/10/93: 23)

European capital has also noticed this. In a recent press briefing by John Cox of the British Chemical Industries Association (CIA), warning was given that if the European Communities introduced unnecessary environmental regulations, the industry might flee east: 'There's a real threat that the worldwide business fabric will change and the Pacific Basin is where science and investment will happen.' (*NS* 28/3/92: 16) Toxic capital has also used the Asian bogeyman to attack European wage and social security costs.

In an interview with the *Financial Times*, Mr Schneider harped on the same theme: 'The main disadvantages we have to face are higher labour costs and expensive social security systems, coupled with widespread regulation of environmental affairs by the state. We have to overcome these handicaps. If we do not, many areas of our business (in Europe) will become uncompetitive and therefore in danger of being squeezed out of the market.' Meanwhile Dr Hans-Helge Stechl, BASF director responsible for Asia, claimed, 'High costs in the established countries are forcing producers to take evasive action, moving to countries where labour and capital expenditure costs offer a more favourable economic framework.' (*FT* 31/5/94: 14)

A new international division of labour in the chemical industry?

These cost advantages represent not only threats to continuing US and European exports to Asia but also to the home markets of European

and US companies. In some cases the competition is already beginning to bite. Fritz Gerber, CEO of Swiss pharmaceutical company Roche, told the company's annual press conference in Basle in May 1994 that the company's vitamins and fine chemicals operations were meeting increasingly stiff competition in European markets from low-cost Far East producers, with particularly strong competition on price coming from Chinese vitamin producers. (*CMR* 16/5/94: 9)

Indian and Chinese companies have been most aggressive in building up European sales in intermediates and bulk active ingredients. One example is provided by the antibiotic furazolidone: in 1993, 64% of the European market was held by Chinese producers, compared with 30% in 1990. (*CMR* 1/8/94: 9)[4]

Other Asian chemical companies are investing in core countries, either through building new capacity or by buying existing companies. The most obvious example is the massive investment by Taiwan's Formosa Plastics in the US, while Korean companies are also reported to be contemplating major investments.

These forces are already bringing changes in the international chemical industry. BASF announced in September 1995 that it was moving its world headquarters for textile and leather dyes from its hometown of Ludwigshafen in Germany to Singapore, as a response to its expectations that Asian production of leather and textiles will rise to 50% of world production in the next few years. Most of the company's dyes are still being produced in Europe, but the company is building a plant at Mangalore, India, and has set up a Chinese joint venture. (*CMR* 18/9/95: 9) In July 1998 BASF closed four dye plants in Germany. (*CMR* 22/7/96: 3)

In September 1994 German company Hoechst AG announced it would end production of a range of basic chemicals for the manufacture of fine chemicals, intermediates and textile dyes, while transferring production of vinyl-sulphone based intermediates for textile dyes from Germany to Brazil, losing 1081 jobs in the restructuring. The company claimed new, low-cost intermediate producers, mainly in Asia, had made manufacture of these basic chemicals in Germany uncompetitive. (*CMR* 5/9/94: 9)

Some observers are suggesting these trends will result in a new international division of labour (NIDL) in the chemical industry, with high-value activities concentrated in core countries and activities lower down

the value-added chain increasingly shifting to peripheral producers. According to Enrico Polastro of A D Little, 'Countries will be switching manufacture of certain basic products offshore to countries like China or India. At the same time they will use their home base to channel more resources into more advanced value-added intermediates, including custom synthesis for third parties. There are considerable cost advantages in producing outside Europe. A chemical worker in Germany costs $50,000 a year, while one in China costs only $1500 annually. But labour accounts for only 10 to 15 percent of costs. Raw materials, environmental and depreciation costs are also important considerations.' (*CMR* 5/9/94: 9,18) In 2001 an OECD report predicted most chemical production in OECD countries will be of speciality chemicals and pharmaceuticals, while developing countries will be leading producers of high-volume commodity or basic chemicals. (*CEN* 20/4/01: 11)

The spectre of the multinationals haunts the shortsighted

Having delineated the increasing multinational involvement in the expansion of the petrochemical industry in Asia, it is now imperative to stress the limited nature of an analysis that fixates on multinationals only. One useful way to deal with this shortsighted vision is to examine the actual motive forces behind petrochemical development in Asia.

Here the Asian experience must be considered in the global context. In the early 1970s the peripheral countries accounted for only 2-3% of global ethylene capacity; by 1982 this had reached 8.5% and was projected to reach 20-22% by 1990. Similar growth has occurred in peripheral countries' share of global capacity in the five major thermoplastics. The OECD has described this growth in the following terms:

'Within a relatively short period, a much more important shift in world production patterns is taking place in petrochemicals than is occurring in most other industrial sectors. And it is happening almost entirely through NFI (new forms of investment), notably joint ventures, much licencing and some turnkey contracts.' (Oman: 75)

The OECD warns against seeing this process as being directed by multinational capital:

'The initiative to create new capacity has almost invariably come from the governments and the large state-owned or state-supported firms of the host countries and it is they who undertake the search for appropriate foreign partners. Foreign investors have never been beating at the

door to take part in these new forms of investment, let alone take the initiative of proposing them.' (Oman: 76) This means that local capital in the periphery is the prime mover, and not just local capital, but specifically state capital.

This is clear in the case of upstream production: 'Almost invariably investment in ethylene capacity in developing countries has been the result of a host-country initiative, and the establishment of strong public corporations with state or mixed public-private ownership. This is the case in Brazil (Petroquisa), Mexico (Pemex), Venezuela (Pequiven), India (IPCL), Korea (KGCC), China (Sinopec), Algeria (Sonantrach), Libya (Rasco), Qatar (QGPC), Turkey (Petkim) and even Singapore (PCS). Nor is Saudi Arabia an exception: SABIC was established and had to begin preparing future petrochemical investments before the MNCs moved its way.' (Oman: 90)

Chapman concurs with the OECD: 'The rapid growth of the industry in the core economies was sustained into the early 1970s, until occurrence of an inflection change around 1973-1974. This, together with the introduction of the industry to more and more countries, has resulted in a significant relative shift in the world distribution of capacity. Although multinational corporations continue to be significant agents of change ... public-sector corporations have played the major role in promoting the apparent geographical spread of the industry since the mid-1960s.' (Chapman: 19)

Chapman's study of the industry also reveals 'a steady decline in the relative significance of foreign direct investment between 1960 and 1990. Although this trend may be arrested (probably in downstream products rather than ethylene), it is unlikely to be reversed.' His conclusions coincide with those of Oman of the OECD: 'Despite the fact that some of the world's largest industrial corporations are active in this industry, its internationalisation cannot be attributed to a kind of corporate imperialism.' (Chapman: 25)

Multinational capital's comparative advantage: technology

One area where MNCs are essential is the provision of technology. Whether MNCs are prepared to transfer technology is a central question in most petrochemical investment decisions. Sometimes MNCs will use their control of technology to demand increased control of joint ventures with local partners: one example of this is provided by Shell demanding its involvement in NOCIL be increased to 51% of the company's

equity; when the local partner refused, Shell abandoned its 'alliance' with NOCIL.

In their criticism of flying geese and product cycle models of South East Asian industrialisation, Bernard and Ravenhill draw attention to the fact that the whole area is dependent on Japan for technology and capital equipment. Dealing with the dependence of Japanese affiliate companies on Japan for capital equipment, they note, 'The dependence on Japan for capital equipment is even higher – more than 75% for affiliates in ASEAN in the late 1980s.' (Bernard: 201)

In general MNCs are happy to transfer technology through licensing, which has recently emerged as another source of income for chemical companies from core countries. An OECD study of technology licensing found that 'the chemical industry is by far the most common licensing industry in the sample,' (Vickery: 10) with 24.6% of licensing in the study being undertaken by the chemical industry. (Vickery: 11) The chemical industry also comes highest in means of technology transfer other than licensing, involving 20% of joint ventures included in the survey, 21% of technology sales, 20% of technology services, 20% of turnkey plant provision, 19% of management contracts and 23% of other means of technology transfer. (Vickery: 17)

State of the art technology?

One benefit claimed for the recent nature of much industrial investment in Asia is that it normally incorporates the most modern technology, including environmental protection technology. As one example, in its review of Thailand, UNIDO observes, 'Being a latecomer in the production of petrochemicals, Thailand bypasses many stages of experiments in environmentally friendly productive process and stands to gain access to the most modern devices.' (UNIDO: xxii) This position is supported by those who should know, western process and construction contractors: 'Contractors are in unison about the region's desire for the latest and best technology that meets stringent criteria, for example, on energy efficiency and environmental protection. Shipping second-hand plants to Asia Pacific is felt to be a non-starter, unless the circumstances are exceptional.' (*ACN* 21/8/95: 14)

One problem with this line is that MNCs may have no wish to license their most modern technology, as it is in that technology that the MNCs' own competitive advantage is increasingly located. The OECD survey found that the chemical industry tended to license not its current

production technology, but the previous generation. 'The drugs and chemical industries most commonly reported licensing technology that they were no longer actively using. By sales, large enterprises (more than $1 billion sales per year) most commonly reported licensing technology that they were no longer using.' (Vickery: 25) This can sometimes coincide with an opportunity to sell an actual plant for which the industry is happy to obtain more than scrap value.[5]

Various examples of such sales have been cited, such as rumours that *BP* was selling its mothballed Baglan Bay cracker to India. (*ACN* 3/7/95: 23) The same source cites the sale to SVC Superchem of a 21-year old PTA plant, formerly owned by Rhone-Poulenc, relocated to Mathura in Uttar Pradesh and expected to begin trial production in June 1996, and the purchase of second-hand membrane cell chloralkali plants by DCM Shriram Consolidated Ltd and by Search Chemical Industries. (*ACN* 25/5/96: 12-13)

Some argue this has occurred with the previous generation of chloralkali plants, specifically the mercury cell chloralkali plants the Japanese industry decommissioned during the 1970s. When this technology was replaced in core countries by newer technology (membrane cell technology) on environmental toxicology grounds, where could this generation of technology go except to the periphery or the semi-periphery? There are strong grounds for believing that much of that technology ended up in Asia, and the spread of mercury pollution and its health effects are deserving of a book in themselves. Nor is that export finished. As recently as 1996, a major coalition of national and international groups prevented the export of such a mercury cell plant from Europe to Asia.[6]

While many Asian companies will demand the most modern technology, this results from a concern with productivity and efficiency rather than worker and environmental safety and health. Companies sometimes reduce the costs of machines by dropping safety features. As one example, 'A US businessman selling machine tools in China told *Newsweek* that Chinese buyers regularly bargained down the cost of his equipment by specifying expensive guards be left off machines. "In the US we would be sued for selling these machines without safety equipment, but who's going to come to China to check?"' (*Newsweek* 9/5/94) Similarly the purchase of equipment does not guarantee its use, another Asia-wide phenomenon. 'In some cases, even if a Chinese factory imports machinery that comes with pollution control equipment attached, that equipment often sits idle. "I visited one factory that had installed a waste-

water treatment system but it was not being used. The manager said it was cheaper to pay the fines and let it just sit there and do nothing rather than pay to maintain and operate the equipment," a consultant said.' (*FEER* 26/6/97: 67)

Sometimes the trade in technology is similar, as in the proposed export from Denmark to Pakistan of mercury cell production technology or in the proposed re-export of rayon production technology from Korea to the PRC, this machinery having originally been exported from Japan.[7]

Thus the edge core MNCs have over local capital is technological capacity and knowledge, including research and development. This then is the competitive advantage the core countries possess: control of advanced technology.

This competitive advantage may be of no great benefit in the context of the Asian petrochemicals industry, where the major push is in commodity chemicals: 'The chemicals that are required are often the product of ageing technology ... For these types of products, "the technology can be bought anywhere," says a VCI (the German chemical industry association) spokesperson. "It is no longer a competitive advantage for European or American companies."' (*FT* 27/10/95: Supp2) Furthermore the number of western companies searching for joint ventures is creating competition and according to an Hoechst spokesperson, 'With the level of know-how in the region, the Asians do not really need us.' The *Financial Times* pessimistically concludes, 'It is the western chemical companies that need Asia, yet with profits set to remain elusive, and overcapacity a threat, it is far from clear that western chemical companies will emerge the winners from an industry shake-out in the region.' (*FT* 27/10/95: Supp2)

After the Asian Financial Crisis

The effects of the AFC on the petrochemicals industry were complex and contradictory. While many projects have been cancelled or postponed, other major projects continue to be announced by chemical MNCs. Certainly, at least some chemical MNCs share the view of Burrell Culp of *BP*, who believes the crisis can still be interpreted as a 'pause for breath'. According to Culp, 'The crisis has its origins in the mismanagement of short-term economic policy and not in long-term structural factors that would depress growth over long periods.' (*ACN* 24/11/97: 4) These corporations expect the crisis to help the economic development of Asia in the long run, with *BP* stating that it expects to see 'very strong

long-term growth in Indonesia', for example. Other MNCs agree. A Ciba spokesperson described the AFC as 'an aberration', noting, 'All the reasons for our initial major commitment to Asia are still there,' while Du Pont says, 'We are still committed to Asia. We view it as a long-term key strategic geographic area for our company – primarily because that is where a lot of consumers are.' (*CEN* 24/8/98: 31-32). On this basis, 'the focus of the major chemical companies has shifted to the ASEAN countries, China and India.' (*HP* Aug2000)

MNCs have put their money where their mouths are. In January 1998 Exxon announced a major aromatics plant in Thailand and the following month Shell finally got approval for its proposed petrochemical complex in Nanhai, Guangdong, after ten years of negotiations with the Chinese state.

While these projects go ahead, many others have been cancelled or delayed, primarily those located in Thailand, Indonesia and Korea. A review in March 1998 noted, 'Specifically, in Indonesia, planned ethylene and aromatics complexes, by among others Dow Chemical, Gajah Tunggul, *BP* Chemicals, Peni, Chandra Asri and Trans Pacific Petrochemical, are all subject to significant delays at least. In Thailand, nearly all the projects planned solely by domestic investors for 1999 onwards have been cancelled or delayed. The Rayong Olefins ethylene plant and the Chevron benzene/paraxylene plants remain on track though both are likely to be delayed. In South Korea there were several expansions planned between now and 2000 but most are now delayed or cancelled.' (*ECN Chemscope*, March 1998: 7)

The same review notes that the problems facing local chemical companies are an opportunity for foreign MNCs to purchase assets at low cost. It quotes one MNC executive: 'This is a glorious opportunity for European companies which have fallen behind in the race to secure Asian production capacity.' (*ECN Chemscope*, March 1998: 5)

The only obstacle to this profiteering is that local chemical companies have understandably been reluctant to sell off their assets at bargain basement prices. 'So far there are only a few examples of this happening: the sale of TPI's stake in Thai Caprolactam to Ube Industries, the disposal of various stakes by South Korean chemical manufacturer Oriental Chemical Industries and the sale of a urethane company stake by Hamwha Chemicals to erstwhile partner Bayer. These transactions are likely to become more common.' (*ECN Chemscope*, March 1998: 6-7)

These early expectations were soon belied. Early recovery from the AFC – with the region escaping the critical stages of the crisis in the beginning of 1999 and GDP growing over 6% in 2000 – meant that the radical change in ownership western observers recommended 'no longer appeared to have a high priority at government level in South Korea and Thailand.' (*ECN* May 2000: Supp16) In relation to South Korea, where overcapacity was greatest, no great change occurred in the industry, though MNCs did purchase a number of niche speciality chemical companies: 'Foreign investment is not happening because Korean firms don't want to cede operational control to foreigners, according to Chem Systems.' (*CEN* 14/12/98: 57)

If the AFC did lead to the shelving of projects by local companies, this was more a consequence of the removal of financing possibilities. With obvious exceptions such as FPG in Taiwan, most Asian petrochemical companies, especially those in SEA, do not have the financial resources for world-scale plants. This leaves the field open to the larger western MNCs. One useful illustration of what is happening is provided by the fate of the $1.7 billion worth of production equipment US contractor Stone and Webster was providing for Indonesia's Trans-Pacific project, where all construction work halted in late 1997. BASF is now negotiating with Stone and Webster to purchase it for its proposed complex at Nanjing, PRC. (*CEN* 12/6/00: 24) A further indication is provided by the general situation in the region's most promising market, the PRC: 'There the six integrated petrochemical projects being negotiated all feature a large multinational petrochemical producer with a 50% stake.' (*CEN* 12/6/00: 25) Despite this, world-class Asian producers such as FPG, Reliance and Shin-Etsu are expected to continue to expand aggressively.

Despite the AFC, demand and capacity for petrochemicals in the region were expected to grow. Industry analysts expected capacity for PE would increase from 22.1% of world capacity in 1993 to 31.1% of world capacity in 2002, PP capacity would rise from 33.6% to 34.3%, PVC capacity from 30.0% to 39.1% and PS capacity from 36.1% to 41.7%, making Asia Pacific the leader in capacity in all these products. (*HP*: May 98) In March 1998 Chem Systems was predicting growth rates for Asian commodity polymer demand to be 25% less than expected due to reduced economic growth stemming from the AFC, but in the longer term 'SEA is expected to recover and account for over half of the world's growth in petrochemical demand in the next decade.' (*CEN* 23/3/98: 20) In August 2000, SRI said chemical demand in Japan, North America

and Europe was expected to grow 'by 0.5% annually until 2010, with demand in ES and SEA growing 6%'.

Notes

(1) For background on the petrochemicals industry see Chapman, K (1991) *The international petrochemicals industry*, Blackwell; Spitz, P H (1988) *Petrochemicals*, Wiley; and Vargara, W and Brown D (1988) *The new face of the world petrochemical sector* (World Bank Technical Paper no. 84)

(2) On contracting in Asia see also *ACN* 21/8/95: 10-20; *Chemical Engineer* 31/3/94: 13-18 and *ECN* 18/3/96: 19)

(3) The classic version of the hazard export thesis is Castleman, B (1979) 'The export of hazardous factories to developing nations', *International Journal of Health Services* 9(4): 569-606. See also Ives, J H (ed) (1985) *The export of hazard*, RKP. For further sources, see *International Journal of Health Services* 15(1): 145-155; 17(2): 343-364. For a critique of the hazard export position, see *Radical Science* 20.

(4) A similar example is provided by imports into Europe of HDPE bags: see *ECN* 14/6/93: 12-18 and *Sunday Tribune* 21/1/96: 13.

(5) On the trade in used factory machinery to peripheral countries, see *FT* 16/1/96: 5 and *BsWk* 22/8/94: 24-25

(6) I owe this important point to Anthony Simoes from Goa.

(7) For the latter example, see the section on Wonjin Rayon in the South Korea chapter of this book.

3

Japan
The original toxic model

The Japanese experience of industrialisation and economic development has been variously and popularly described as a miracle or as a model. Japan is of course the first and most astounding Asian miracle, the only Asian country to penetrate the core. 'Between 1950 and 1990 real incomes per head rose from $1230 (in 1990 prices) to $23,970, a growth rate of 7.7% a year. Over the same period America managed growth in incomes per head of just 1.9% a year. Japan's post-war economic performance is unsurpassed in the history of the world.'[1] (*Econ* 6/3/93: Supp1) Despite its stagnation during the 1990s, Japan is still the major economy in the area, about seven times as large as that of the PRC and ten times the size of South Korea's, according to the OECD. (*CEN* 13/12/99: 21)

The Japanese model has been widely analysed. It involves strong coordination of the economy by the state, acting in concert or collusion with local capital. While some have described it admiringly as alliance capitalism, others have condemned it as 'an Iron Triangle of bureaucrats, politicians and industrialists'. The state planned industrial development, supporting import substitution industrialisation (ISI) through tariffs before quickly moving towards export oriented industrialisation (EOI). The role of the Ministry of International Trade and Investment (MITI) in this has been crucial. Japanese production techniques, such as Just-In-Time methods, were adapted globally. The other structural component

of Japanese industry – the group of companies, with interlocking ownerships and generally its own bank, accompanied by a maze of subcontracting relationships – has by and large been emulated only in Asia.

Cummings describes Japanese industrialisation as having three phases: the first began in the 1880s, with textiles as the leading sector; the second – with the heavy phase involving steel, chemicals, armaments and finally cars – commenced in the mid-1930s and lasted till the mid 1960s; the third, which is still continuing, involves high-technology knowledge industries such as electronics, microprocessors, computers and telecommunications. (Cummings: 45) The next stage, currently being planned by MITI, sees Japan upgrading to 'environmentally-friendly' industries and technologies.

Being a late industrialiser, Japan's main advantage lay in low wages and a divided working class – a minority of regular workers enjoying excellent wages and conditions and a larger group of temporary or part-time workers, generally paid only a third of regular workers' wages. This division is of course manifest also as a gender division: 'Over two-thirds of the floating reserve army of labour (low-paid insecure workers who move from job to job), which itself comprises a full half of the active working class, has been female.' (Steven: 11) According to Steven, 'Low-paid female labour has been the Japanese bourgeoisie's chief weapon in its struggle to build new internationally competitive industries after the Pacific War.'[2] (Steven: 10)

The Japanese working class is also divided along lines of subcontracting relationships between large and small firms, 'where the large firms dictate prices, conditions, etc., to their networks of suppliers and, when crisis strikes, export it into the smaller companies. Wages and conditions deteriorate to the levels of temporary workers as one moves down the hierarchy of subcontracting and re-subcontracting ... The system of subcontracting has been of comparable importance to the temporary labour system in ensuring compliance with appalling conditions by the bulk of the Japanese working class.' (Steven: 11) These conditions include a longer working week, with Japanese workers working 43.6 hours a week in 1985, compared with 38 hours in the US, 36.5 in West Germany and 37.2 in France. In all, Japanese workers work between 200 and 500 hours more each year than workers in core western economies.

Thus the Japanese miracle can be seen to be based on the old formula of super-exploitation of workers. In effect, the position of women

in Japan's early industrialisation resembles that of women in the current industrialisation of SEA and the PRC, as does the industry in which they work. 'The masses of peripheral workers, however, bore the brunt of the contradictions and human depredations of capital accumulation and the development process. Until 1930, the peripheral sector of unskilled industrial labour was made up principally of women, most of whom were young and of rural origin. This peripheral sector was utterly vital to Japan's early development as a modern and eventually core economy in the world system. In the early textile industries, young single women, many actually children, were housed in squalid company dormitories and worked either 12-hour shifts, alternating day and night shifts every other week, or as many as 16 hours or more in single day shifts.' (Carney: 118-119)

As well as women, nature was heavily exploited. One Japanese ecologist notes that the rush to industrialise meant that 'rapid economic growth and industrialisation was promoted to the exclusion of all else, and, with this, environmental pollution became a rapidly expanding feature of the structures of economic and military power. Through the pre- and post-Second World War eras, environmental destruction became a permanent feature of Japan's industrialisation process, one inherent in Japanese forms of modernisation.' (Ui Jun: 1)

Primary accumulation in Japan was achieved in no small way due to this environmental destruction: 'Through a combination of low wages, import and export controls, and unrestrained waste discharge, a high rate of economic growth was attained by Japanese industry. Japan's main industries – iron and steel, cement, pulp and paper – succeeded in primary capital accumulation by forgetting the diseconomies of environmental pollution and spending the larger portion of profits on new productive equipment. The dual structure, a unique characteristic of the Japanese economy, with its layer of subcontractors, helped channel the social costs for pollution or work hazards downstream to be borne by the small and medium-sized industries. The disregard of large corporations for pollution problems, therefore, played no small part in their accumulation of large amounts of capital.' (Ui Jun: 2) This is confirmed by Miyamoto: 'Corporations economised on environmental protection investments and cost of pollution control so that they could accumulate maximum capital for increased production.' (Miyamoto: 79)

This industrialisation was at the expense of primary, natural resource based industries: 'Pollution problems adversely affect primary industries such as farming, forestry, fishing and related occupations ... The deterio-

ration of primary industries in Japan has been allowed to continue to an intolerable degree. As an example of this it is to be noted that Japan's domestic production of primary food calories has dropped to 40% of total calorific consumption ... This is an important factor that should be taken into consideration by other nations of Asia as they head inexorably towards industrialisation.' (Ui Jun: 174)

Scrap/build/export: Up the product ladder

Japan succeeded in moving up the product ladder during its industrialisation, from textiles and light industry, to heavy and chemical industry, to the machinery and information industries, basing each move up the ladder on the capital accumulated at the lower level. 'Post-war accumulation has been accompanied by a continuous process of industrial restructuring, or what has been called "scrap and build". Right up to the first oil shock in October 1973 this took the form of running down the light industries which throughout the pre-war period had generated the surplus for the state to build infrastructure and subsidise heavy industry, and then building heavy industry into the dominant pillar of Japanese capitalism. Until 1973, the so-called "miracle" was based on the heavy chemical and basic materials industries processing imported raw materials and exporting iron and steel, ships, chemicals and petroleum products.' (Steven: 9)

This development involved the integration of much of EA and SEA into the Japanese system of production, whether as a provider of raw materials or of cheap labour through the international extension of the Japanese subcontracting system. Steven describes three waves of Japanese FDI into Asia. The first wave, in the 1960s, was motivated by the search for cheaper labour, mainly in textiles; the second involved a search for continuous supplies of raw materials and energy, 'the basic materials investments of the 1970s also mainly in Asia, but in Latin America and Australia as well', (Steven: 67) and a final wave, related to the high yen crisis, mainly in the machinery industries, into Asia and North America. (Steven: 66-67)

The wave in the 1960s involved moving cotton textiles to Asia, while consolidating synthetic textiles, the sector involving the highest level of technology, at home. (Steven: 69) Synthetic textiles were exported later, in the following decade: by March 1974, Toray and Teijin, responsible for 83% of total Japanese synthetic fibre investments, had overseas capacity, including capacity under construction, equal to 60%

of home capacity. (Steven: 70) This export first targeted South Korea and Taiwan but, as wages rose in the 1970s, began to target ASEAN. Japan pursued an aggressive diplomatic policy in coordination with this export of capital, signing economic cooperation treaties with Taiwan and South Korea in 1965 and setting up the Asian Development Bank in 1966. (Steven: 69)

The high yen crisis of the 1980s led to the increased export of industrial production, a process of de-industrialisation described as *endaka*, or hollowing-out.[3] If this process continues, even the chemical industry may be threatened: 'If the currency continues to strengthen, it seems inevitable that industries such as chemicals will eventually have to abandon production in Japan altogether ... Sato (president of the Texas subsidiary of Nisseki Chemical) reckons that half the chemical jobs in Japan may have to go.' (*FEER* 11/5/95: 66)

The high yen crisis was followed by a decade of stagnation in the 1990s. Faced with lack of domestic demand, the Japanese state undertook increasingly large – and increasingly unnecessary – infrastructure programmes to stimulate growth. These programmes supported what McCormack calls the *doken kokka*, or construction state, centred on an 'Iron Triangle of politicians and bureaucrats, financial institutions and the construction industry', and which supports a public works programme that will provide sinecures to bureaucrats when they retire, new projects to benefit local politicians and a continuing market for the construction industry. 'Japan's public works sector has grown to be three times the size of that of Britain, the US or Germany, employing seven million people, or 10% of the workforce and spending ... around $350 billion, 8% of GDP a year.' (*NLR*13: 11) Despite the lunatic debts much of the grandiose infrastructure projects of the 1980s and 1990s accumulated, the construction state continues to march on: the current plan ranging till 2010 involves 'new railway lines, express highways, airports, information systems, no less than six new bridges between the islands, large dams and nuclear installations and, last but far from least, a new capital city.' (*NLR*13: 14)

Development of the petrochemical sector

'The Japanese chemical industry came into being at the end of the 19th century as a diversified collection of small firms using very simple processes. Little progress, economic or technical, occurred until the 1930s, when the military government encouraged the construction of relatively large-scale plants producing basic chemicals for munitions.' (Enos: 218)

At the end of the 1930s the Japanese government pursued R&D into synthetic rubber. Mitsui Chemical cooperated in the research and, as sole supplier of synthetic rubber to the Japanese navy, produced some 350 tonnes during World War II.

Artificial fibre production began in 1909. By the 1930s the Japanese rayon industry included firms with R&D departments, including Toyo Rayon, a division of Mitsui, which invented Nylon 6 in 1940 and set up production for the Japanese navy.

Thus the growth of the Japanese chemical industry was closely tied to Japanese military ambitions. This was in no way unusual as chemical industries in the US and Europe had similar military ties, while some companies, such as Du Pont and Nobel, began as munitions companies and later developed into chemical companies. Under the US occupation, production of synthetic rubber was banned. As a result, Mitsui and other companies transferred research workers to plastics research, particularly VCM, with Mitsui opening its first plant in 1949. In 1951 Toyo Rayon obtained a licence from Du Pont and enjoyed a government-supported monopoly of nylon production until 1974. Mitsui also pioneered PE production in Japan, constructing a 12,000 tpa plant using its own technology in 1958. (Enos: 219-220)

The Japanese petrochemical industry began in 1958 with the start-up of the Mitsui Petrochemical Industries' complex at Iwakuni in the Yamaguchi Prefecture. The Japanese state, particularly MITI, was heavily involved in the start-up of the industry, having identified it as a key industry to be supported and guided. MITI's first report appeared in 1951, and by 1953 plans for petrochemical production were being submitted to MITI. State involvement was not limited to directing the process: 'As part of its support for the petrochemicals industry, the Japanese government provided about one quarter of the finance for plant investment.' (Ward: 11)

By the end of 1959 Japan had four ethylene plants producing 80,000 tpa. In the second phase (1959-1964), a massive ethylene capacity was constructed, reaching 700,000 tpa by 1964. In the third phase (1965-1969), further ethylene capacity was built, with government rules now requiring a minimum cracker capacity of 100,000 tpa. By the end of 1968, Japan's petrochemicals industry was the second largest in the world. (Ward: 12) 'Between 1969 and 1971, the petroleum-chemical industry grew 11% annually, and 8% after 1971.' (Miyamoto: 80)

Following the 1973 oil shock/oil crisis, the Japanese industry found itself in a structural recession caused by a major increase in the price of its naphtha feedstock. By 1983 ethylene capacity was 6.5 million tonnes, while demand in 1982 was only 3.6 million tonnes. In 1983 producers formed a cartel with government approval to eliminate excess capacity. In 1987 the industry began to recover and new plans for ethylene capacity were readied. In 1990 the total turnover of the Japanese chemical industry was 23,646 billion yen ($163.3 billion.) (Ward: 4) while 'the chemical industry is Japan's fifth most important manufacturing sector.' (Ward: 5)

Environmental crisis

The environmental costs of this accelerated development were indicated by a series of pollution scandals during the 1950s and 1960s. Previous waves of industrialisation had already generated pollution, but no lessons were learned from this history as Japan hurtled into industrial development, especially in the heavy and chemical industry (HCI).

The paradigmatic example of modern Japanese pollution can be found in the Minamata story.[4] Chisso began operating in Minamata in 1907 and by 1925 was already paying indemnity money for damage to fisheries. From its original base in fertilizers the company expanded into plastics, drugs and perfumes, and opened a huge plant in occupied Korea. In the 1930s it began dumping mercury waste from acetaldehyde production. With the end of the War, Chisso lost its Korean plant, but with Japan's miraculous economic growth, Chisso's production at Minamata expanded: between 1951 and 1957 its output of vinyl chloride rose 1000%.

In 1955 the first symptoms of Minamata disease began to appear. A company doctor discovered in 1959 that mercury waste was responsible: 'Chisso responded by silencing him, ordering him to discontinue his experiments, and disingenuously offering a modest amount of *mamaikin*, consolation money, to the victims, with the rider that even if at a later date Chisso were judged to have been at fault, those affected would not sue. The money changed hands. With a PR flourish, Chisso installed a "Cyclator" to clean their waste water, a device which researchers later found to be useless.' (Popham: 30) In 1968 Chisso stopped dumping mercury waste when its production technology changed.

The Minamata story is also paradigmatic because of the early use of direct action by those affected. 'To local fishermen, who had watched the number of victims grow as their catch steadily declined, Chisso's con-

duct was inexcusable. In a series of protests, they stormed the factory, at one point holding the executive director hostage overnight and causing extensive damage to company buildings.' (Kaplan: 175)

Among other tactics, activists attended annual general meetings of the company to raise the pollution issue. Chisso called in the help of *yakuza* (gangsters) against the victims and their supporters, using them to physically attack and disperse protests and to prevent questioning at shareholders' meetings.

On 20th March 1973 Chisso was finally ordered by the District Court to pay compensation of 937 million yen. Chisso has continued to pay out compensation: by 1991 Chisso had paid out £450 million in compensation. (Popham: 33). By then 2000 victims had been compensated. Another 20,000 cases are in the pipeline. Still Chisso isn't doing badly: 'For its part, Chisso appears to have decided that the best approach is to pretend that the whole thing never happened. Thanks to hefty government support the firm has continued to prosper ... It produces many of the chemicals at the heart of the continuing Japanese economic miracle ... Visitors to the Minamata plant are shown a video relating important dates in the company's development, but the time Chisso made Minamata famous by killing off its citizens does not rate even the most euphemistic mention.' (Popham: 33)

Some indications of the depth and ubiquity of the Japanese environmental crisis can be found by examining Iijima's detailed history of environmental pollution in Japan. Another indication is available through checking the body count. 'In 1978 the Japanese Environmental Agency (EA) admitted that there were 63,741 "official" victims of pollution to whom the government pays medical fees and other expenses under the terms of the Act. But it is believed that there are over a million Japanese who suffer from pollution-related diseases to whom no compensation will be paid unless a court intervenes.' (Hase: 7)

What did emerge in response to the pollution crises was a corporate resolve – supported by important elements of the Japanese state – to avoid accepting responsibility at all costs. Thus, while in the Minamata case a team from the Ministry of Health and Welfare (MHW) identified mercury poisoning as the cause and the Chisso Fertilizer Plant as the culprit, 'MITI, the friend of the corporations, stepped in and supported Chisso's argument that Chisso was not the cause ... Business brought pressure to bear on the LDP to disband the study team within MHW, and

MITI obligingly arranged for the Economic Planning Agency, over which it had influence, to complete the investigation. As a result, all research was simply suspended.' (Thomas: 212)

Cover-ups continue

In 1964 Minamata disease reappeared in Niigata. In March 1966 the MHW concluded the cause was pollution from a local Showa Denko factory, which used the same process as Chisso. MITI intervened again on the side of industry, but in May 1966 the local university medical school found Showa Denko was discharging mercury: 'When the survivors and the families of the deceased eventually demanded compensation at the company's general meeting, they were physically attacked by company gangsters. The police arrived too late to prevent injury. In February 1967 Showa Denko's president proclaimed over national television that no matter what the findings, his company would not accept or comply with them.' (Thomas: 213-214). Further cover-ups occurred: 'In 1975 a major chemical firm in Tokyo was found to be causing lung cancer by polluting nearby school and residential areas. In a typical "incident", the enterprise, the labour union and the national government collaborated in a massive cover-up. Among those who tried to hide the facts from the people were the Tokyo metropolitan government.' (Thomas: 219)

Opposition to petrochemical development

The first petrochemical complex was not long on-line before its environmental and health effects became manifest: 'Yokkaichi Asthma came about soon after 1960 when the Yokkaichi Petrochemical Industry Complex, the first of its kind in Japan, and the largest in Asia, started operation ... Eventually in 1963, a national research team recognised that Yokaichi Asthma was caused by the air pollution from the complex. Even so, neither the government nor the corporations started compensating the victims and replanning city projects. Rather, they quickened the pace of expansion of the industrial complex.' (Miyamoto: 74) In July 1972 the plaintiffs in the Yokkaichi litigation won their case.

The response to Yokkaichi was not confined to that project. 'In 1961 citizens protested the construction of another petrochemical complex at Nishinomiya (Hyogo Prefecture, near Osaka). This protest led to the first use of modern science and technology for a presiting survey in Japan.' (*EST* 9(6): 513) After this survey was completed the plan was cancelled.

The next petrochemical complex also came in for sustained opposition. 'When further petrochemical development was scheduled for Shizuoka Prefecture in 1964, citizen pressure there, under the slogan "No More Yokkaichis!", finally caused abandonment of the project, much to the shock of the national and local governments.' (*EST* 9(6): 513). These struggles represented a model which other citizens' movements were able to adopt and adapt. Opposition to petrochemical development reached its highest point in 1973: 'During the first half of 1973, Japanese economic growth was at its peak, and all petrochemical complexes continued at maximum production, far exceeding capacity, causing a chain reaction of plant explosions everywhere. Widespread coastal mercury and PCB pollution was discovered nationwide, so that Japanese fishing was panic-stricken. Angry fisherfolk blockaded many industrial ports, and some complexes had to stop operations.' (Jun: 222)

What must not be forgotten is that these groups were the latest example in a long history of struggle between peasants and fishing people and extractive and manufacturing industry in Japan that stretches back to 1748. (Iijima: 4)

The core of the Japanese environmental movement is local rather than national. In 1975 the Japanese Environment Agency estimated some 1286 local environmental groups existed in Japan, but this is considered an underestimate. (Hase: 5)

The failure of pollution compensation groups to bring about material change in pollution gave a major impetus to the growth of anti-development groups. While most of the victim compensation groups fought valiantly through the courts, their compensation in the end did not change the basic situation. Writing from Minamata in 1991 Popham reported, 'The chemical factory in the town centre, which gave Minamata its evil reputation, is still spewing smoke, the canal that runs past the factory is still stinking nauseously, and the sweet and acrid smell is still ubiquitous.' (Popham: 28) In the Yokkaichi case, 'In spite of the ruling, the five companies that were defendants ... continued to discharge poisonous fumes.' (Thomas: 215).

Since then the dodgy nature of court victories has been illustrated again and again: 'The verdicts of the first and second Shinkausen lawsuits, the Date power plant lawsuit and the Tanagawa Second Electric Power Plant pollution lawsuit, and the Route 43 highway pollution lawsuits all recognize compensation for damages but reject injunctions that

would have made it obligatory for countermeasures to be taken at the source of the pollution.' (Miyamoto: 90)

Another major problem with these legal cases was the length of time it took to extract compensation through the system: 'In March 1991 ten companies on Osaka were ordered to pay over 1400 million yen to victims of air pollution following a trial that had taken thirteen years.' (Popham: 33)

A more recent court decision has again emphasised the limitations of legal strategies. In January 1994 the District Court in Yokohama ordered twelve local companies to pay 463 million yen in damages to 435 local residents of Kawasaki who suffered chronic asthma, bronchitis and pulmonary emphysema due to factory emissions, but it refused to order the companies to decrease the factories' pollution discharges. That case took 12 years. (*FT* 26/1/94: 4)

In recent years local struggles have mainly focussed on infrastructure projects. 'Since the 1980s, major activities causing environmental degradation have shifted from manufacturing industries to public works projects. Public investment for infrastructures, such as roads, new towns, railways, harbours and airports has been promoted as an economic measure to increase domestic demand.' (Imura: 365) Here the struggle against Narita airport is the paradigm.[5]

More recently, the focus of opposition has changed to leisure-related developments such as golf clubs that have overrun Japan. These leisure developments have met setbacks. In 1990, for example, pressure from environmentalists blocked the construction of a major leisure resort in northern Japan (*FT* 9/7/90: Supp X), while a Japanese observer notes, 'More than 10 golf-course projects have been stopped recently by campaigns against them.' (Sugimura: 272)

Indeed with continued local resistance to infrastructure and leisure projects and increasing opposition to incineration, some observers claim a revival of citizen movements can be seen in the late 1990s, especially in peripheral areas of the country, a revival that is reflected in the growth of local referenda. (Nakezawa: 1) McCormack reports on local opposition to the projects of the construction state: 'Intense local campaigns have led to the cancellation of the planned Yoshino river estuary dam and the Kito village Hosegochi dam ... the desalination and reclamation of large sections of Lake Nakaumi has finally been stopped ... a long citizen campaign has succeeded in partially blocking the planned Expo.' (*NLR* 3: 19) The

other notable area for opposition is the anti-incineration and anti-dump movement, growing out of the waste wars of the 1980s.

Finally it is worth noting Ui Jun's characterisation of the class composition of the Japanese environmental movement: 'The specific character of the Japanese environmental movement derives from the fact that it started as a federation of lower middle class schoolteachers, local government workers, small shopowners, small landlords, with fisherfolk and farmers, those who are mostly outside the market economy. The central core is still the lower middle and poorest classes.' (Jun: 224)

Government environmental regulation

The first pollution control legislation was introduced in Japan in 1958 with the Water Quality Protection Regulations. Some indication of the scope of these regulations can be found in the fact that they did not apply to the Minamata situation, already a major disaster at that time. (Miyamoto: 74)

In response to this crisis, the Japanese government acted, setting up the Environment Agency (EA) in 1971. Selecting specific air pollutants, the government undertook programmes to reduce their emission and when these targets were reached the state claimed to have conquered air pollution.[6] Low permissible levels for these pollutants allowed Japan to claim it had some of the strictest air pollution regulations internationally.

As well as implementing this spectacular pollution control, the government also moved to deal with the victim compensation crisis. After the Yokkaichi victims' court victory in 1972, government 'in the fall of 1973 established the "Pollution Related Health Injuries Compensation Law", the first of its kind in the world. A health-impaired working person was aided up to 80% of his or her average salary, and all victims could waive medical costs and join programmes for rehabilitation.' (Miyamoto: 78)

With the advent of regulation, pollution spending soared, unsurprising given the failure to previously invest in pollution control. 'Spending for pollution abatement by industry increased rapidly after 1965 and reached a peak of nearly 18% of total capital expenditures in 1975.' (Corwin: 154). Also, 'the reported total investment for pollution control by industry between 1965 and 1975 was about 5.3 trillion yen (at 1970 price levels) – about $15 billion. These costs represent a significantly higher proportion of total private capital investment than occurred in other industrialised countries during this period.' (Corwin: 154)

The chemical industry invested its fair share. In 1974 the chemical industry spent $837 million on pollution control. Over half of that went on a mandatory programme to convert chlorine/caustic soda production from mercury to diaphragm cells to deal with mercury pollution problems. (*CEN* 28/7/75: 10-11) In 1975 chemical industry pollution control expenditure reached $1.1 billion, the highest such outlay among Japan's industries.

In 1977 the OECD issued a report on environmental policy in Japan, largely based on data up to 1975. 'Based on this OECD evaluation, Japan's Environmental Agency considered that industrial pollution had ended and all that was necessary was to work towards the realisation of environmental amenities.' (Miyamoto: 88)

Given that the EA considered environmental pollution to have ended, it is no surprise that capital quickly abandoned investments in pollution control. 'In 1975 Japanese industry's investment in pollution abatement was 964.5 billion yen (17.7% of total investments on equipment). In 1977 it was only 404.9 billion yen (9.7%) and in 1979, 290.1 billion yen (4.5%). Calculated after adjusting for changes in commodity prices, investments in pollution abatement in 1979 were no higher than 1970 levels.' (Miyamoto: 88)

Both capital and state relaxed: 'Administrative measures against pollution became less and less aggressive in the late 1970s. Even the courts followed suit and started ruling partially and, in some cases, entirely against the victims of pollution ... Even today, regulations against pollution are becoming less stringent.' (Miyamoto: 72-73)

More generally, environmental regulation in Japan, closer to the English than the American model, is unlikely to inconvenience capital: 'Enforcement of environmental standards in Japan has generally relied on "administrative guidance", not coercion ... A 1976 analysis of 1,200,000 plant inspections by regulatory agencies showed no prosecutions and less than 200 official orders for change: administrative guidance had been relied upon to resolve problems in 4700 cases.' (Corwin: 155)

The consistent downgrading of EIAs is exemplified by the attack on the EA-produced EIA of the proposed Honshgu-Shikoku bridge, while industry has attacked both EIA and the EA. In 1980 Hase noted, 'Decision-making procedures are far from satisfactory as far as adequate information and public participation are concerned. Public hearings are a formality: usually the decision is already made.' (Hase: 15-16)

In 1984 the government decided that EIA guidelines would remain advisory and that industrial 'self control' was sufficient for environmental protection purposes; in 1986 designated pollution control areas were abolished; in 1988 the pollution compensation law was diluted. Thus the various advances won by popular protest were slowly undermined by the state.

'Business opposition to all environmental protection has been consistent. When the EA tried to introduce a bill in 1976, the Federation of Economic Organisations and the LDP opposed it. The cabinet even refused to submit it to the Diet. The bill was returned to the agency five times for revision. On each occasion the agency made the bill's provisions weaker.' (Thomas: 211).

Occupational safety and health

Industrial deaths and injuries in Japan declined from 468,000 a year in 1960 to 182,000 in 1993, (*Newsweek* 12/12/94: 23) reflecting Japan's movement up the product ladder and the increasing value of Japanese labour. Another view of these figures is provided when it is noted that in 1993 the number of deaths at work in Japan dropped to 2245 compared with 2345 the previous year, but the number of accidents in which more than three workers were severely injured or died has increased to 183 in 1993, compared with 166 in 1992. (*WHIN* 45/46: 10) Occupational hazards are more prevalent among marginal, migrant and minority workers.

In this area as well, the Japanese state has no desire to stringently control the depredations of capital: 'About 200,000 workplace inspections are carried out annually among Japan's 6 million work places ... Inspectors often only review the records, without on-site tours, environmental measurements or interactions with workers. Although inspectors have formal police power and may stop dangerous processes or impose criminal penalties on violators, such sanctions are rarely invoked. Finally, in about 75 per cent of those inspections that yield a violation, subsequent compliance is monitored only by mail.' (Reich: 810)

Restructuring offshore

The public reaction to the environmental destruction that accompanied Japanese industrialisation led to much of the industry restructuring by moving offshore to more receptive climes. Iijima records the first instance of this in November 1885 when Besshi Dozen acquired the unpopulated island of Shisaka-jima to relocate its Niihama copper refinery there following complaints of sulphur dioxide pollution. (Iijima: 25)

The early 1970s saw the introduction of a new strategy to redefine the long-term path of the Japanese economy, and this 'led immediately afterwards to the rapid expansion of Japanese chemical-related investment in both developed and under-developed countries.' (Darby: 9) This new policy was explicitly formulated in a 1974 MITI document (Long Term Vision of the Industrial Structure): 'The policy emphasised a shift from "pollution-prone" and "resource-consuming" heavy and chemical industries towards "clean" and "knowledge-intensive" industries and assigned overseas investment a new role -that of a catalyst to "houseclean" the economy.' (Ozara, cited in Darby: 9)

According to Steven, the 1974 document was the first coherent statement of this strategy: 'It rationalised and urged the continuation of moves already under way, e.g. the investments in logging and the production of woodchips in South East Asia which began towards the end of the 1960s. Particularly the primary processing stages of the basic materials industries – steel, non-ferrous metals, petrochemicals, pulp and paper – were all told to go overseas, so that Japan could concentrate on machinery, final processing and final assembly.' (Steven: 74)

The heavy polluting chemical industries, which formed the basis of Japanese modernization until then, were downgraded, with a switch in emphasis, in general towards machinery, and, in the chemical industry, towards fine chemicals. This was based on the recognition that the heavy chemicals industry in Japan was handicapped by a shortage of sites and raw materials, as well as pollution problems. Of course, 'the wholesale exodus of Japan's chemical industry was never a likely proposition, and only those firms with serious operating difficulties, or new marketing strategies, were attracted to offshore locations.' (Darby: 8)

Nor was this export purely to peripheral countries: 'Japanese chemical foreign direct investment to the US quadrupled during the period 1973-1976.' (Darby: 15) But that this investment was primarily directed to the so-called developing countries can be seen from the Table 2 (*p.59*):

Thereafter, overseas Japanese chemical FDI declined with only 19% of Japanese manufacturing FDI being chemicals-related in 1982. Japan also undertook a policy of importing, rather than manufacturing, toxic substances: 'The large-scale purchasing of hazardous-to-produce commodities, such as VCM and acrylonitrile, was a conspicuous feature of this period.' (Darby: 33) Similarly, Oman in his OECD report noted, 'Japanese investment in Saudi Arabia is a form of international vertical

Table 2: Japanese FDI, Japanese Chemical FDI in Europe, US and the world. ($ million)

		A(Chemicals)	*B(TotalManuf)*	*%A/B*
Europe	1968	1	11	9.09
	1976	54	255	21.18
	1980	96	683	14.06
USA	1968	2	122	1.64
	1976	46	832	5.53
	1980	230	2030	11.33
World	1968	16	493	3.24
	1976	887	5164	17.18
	1980	2312	10867	21.18

(Source: *Darby: 18*)

integration, and consequently the Japanese consortia have committed themselves to purchase and ship back to Japan a significant share of output.' (Oman)

In this second period of Japanese FDI, investments, as well as companies investing, were larger. 'Mining investments were almost exclusively by giant firms, as were 80-85% of those in chemicals and metals.' (Steven: 75) This second period saw the development of the ASAHAN aluminium smelter and LNG in Indonesia, the Kawasaki steel sintering plant in the Philippines, pulp and paper mills as well as steel mills and an aluminium plant in Brazil, and four petrochemical projects – Mitsui in Iran (1973) and South Korea (1977), Sumitomo in Singapore (1977) and Mitsubishi in Saudi Arabia (1981). (Steven: 75)

In the Japanese case it also involved an attempt to integrate natural resources outside Japan directly into Japanese production. Kenji includes, in MITI's strategic planning for the 1980s, 'increased efforts towards large scale investment of heavy and petrochemical complexes in the Third World, that are structurally incorporated abroad as complementary and integral parts of Japanese capitalism, thereby expanding and maintaining the worldwide strength of Japanese capitalism. In other words, the emerging strategy is ambitiously aimed at integrating as many resources

and industrial capabilities of the Third World as possible, under the hegemony of Japanese capital.' (Kenji: 70)

As to how hazardous this export was, Miyamoto quotes statistical evidence from one survey of 38 companies in metropolitan and 110 companies in peripheral areas: '64.9% of the total enterprises have waste treatment facilities, 56.1% plant greening plans, 39.9% scrubbers, 34.5% waste incineration facilities, 14.9% noise control facilities, 13.5% exhaust gas recovery systems and 13.6% smoke and dust treatment facilities. This is similar to that in advanced countries.' (Miyamoto: 97)

In December 1991, a survey of 2843 firms by MITI found 261 firms (or 11%) declaring that their overseas subsidiaries or affiliates had pollution problems. Of these firms, 158 said their overseas subsidiaries or affiliates had been told by environmental authorities to take steps to prevent further pollution, thirty-nine had complaints from the public and nine were subject to lawsuits. (*AMPO* 23(4): 52-53)

Exporting hazards to Asia

The major focus of Japanese chemicals FDI was not just on 'developing countries', but on Asia. With the second wave of FDI in the 1970s, 'Asia was as prominent as before (70% in 1970-79) in receiving the bulk of Japan's new chemical investments, particularly the polluting ones.' (Steven: 84)

Similarly, a review of the industry for the Economist Intelligence Unit notes: 'Japanese chemical companies are major players in the Japanese manufacturing diaspora; chemicals represent the third largest sector for overseas locations ... Japanese chemicals producers are focusing most of their interest on the extended hinterland of the Asia-Pacific region. While North America accounts for 19.4% of Japanese overseas production plants and Europe accounts for 12.2%, the Asia Pacific region is the home of 60.5% of overseas sites.' (Ward: 111)

The major strategy of hazard export by Japanese capital began in 1970 and declined towards the end of that decade. This pattern can be seen in Japanese chemical foreign direct investment projects in both Indonesia and Malaysia. Of thirty Japanese chemical projects in Indonesia between 1969 and 1984, twenty-six were established from 1970 to 1979, while, of twenty-nine similar projects in Malaysia over the same period, nineteen were established in the 1970s. (Steven: 44, 50)

From 1970 to 1974, chemicals was the area of Japanese FDI in Indonesia with the fourth highest number of projects. After 1974 chemicals came to be the area with the second largest number of projects. Steven notes, 'Thus although the investment climate in Indonesia was cooler towards Japanese capital after 1974, there were forces in both countries that maintained the alliance. The Indonesian side needed the technology and finance that Japan commanded, while the latter were happy to find an overseas outlet for industries they were phasing out domestically.' (Steven: 45)

The primary recipients for this export of toxic capital were Korea and Taiwan, though massive investment also went to Singapore and Saudi Arabia. Japanese petrochemical promiscuity spread from NEA to SEA. By 1987, cumulative FDI by the Japanese chemical industry in Indonesia was $132 m, in Malaysia $189 m, in the Philippines $72 m, in Singapore $494 m, in Thailand $45 m, in Taiwan $89 m, in South Korea $285 m, in China a mere $17 m and in Hong Kong a measly $8 m. (Healey: 215-224)

Continuing environmental crisis

Unfortunately for those who wish to present Japan's pollution problems as over, the Construction Ministry admitted in August 1985 that only 44 of Japan's 109 major rivers met environmental standards. (Thomas: 220)

The chief of the water supply division of the Ministry of Health and Welfare said in 1993, 'In 1983 we found about 80 sources were polluted, and less than 10 million people suffered with bad smell and taste. Last year 100 sources had a problem and 20 million people suffered.' (*FT* 14/4/93: 18) Recently reports are also surfacing of pollution due to the electronics industry, echoing the pollution of Silicon Valley, with Toshiba and Mitsubishi reporting groundwater contamination beneath their factories. The latter, in fact, suspects that groundwater at sixty of its 112 Japanese plants may be contaminated. (*AMPO* 23(3): 14-17, *Econ* 28/7/98: 67)

Toxic waste

It is in waste disposal that we can most clearly see the continuing Japanese environmental crisis. In 1980, according to UNEP, Japan generated some 292 million tonnes of hazardous 'industrial chemical waste'. This had grown to 312.3 million tonnes by 1983. Much waste is dumped far from where it is generated due to the problems posed by existing lim-

ited capacities for dealing with toxic waste. 'Furthermore, due to the long distances to disposal sites and increasing costs of disposal "illegal disposal of industrial wastes ... is quite common" and an "economic phenomenon" ... And as recently as 1989, serious illegal waste dumping schemes involving 8000 drums of highly toxic wastes (PCBs) were arranged in Japan.' (Hilz: 22-23)

If one can believe the statistics, Japan actually produces very little hazardous waste: 'The annual output of 800,000 tonnes, which accounts for just 0.3% of all industrial waste, is far less than the 275 million tonnes produced in the United States.' (Kazuki: 15) This particular Japanese miracle is, however, the result, not of Japanese adoption of non-toxic production processes, but of bureaucratic semantics: the Japanese authorities have adopted a 'narrow definition of hazardous waste ... which has excluded types of waste which would have been included in the standards of other countries.' (Kazuki: 15)

Despite these semantic games, waste disposal is an increasing problem in Japan. According to Kumamoto Kazuki, 'Illegal dumping takes place on a daily basis all over the country. Every year there are some 5,000 cases of people being arrested for these activities, but this represents only a small portion of those caught dumping, and an even smaller fraction of the actual cases of illegal dumping. There may be several tens of thousands of cases every year.' (Kazuki: 18) Kazuki attributes this illegal dumping to three sources: industry's attempts to cut costs, fierce competition between the 60,000 firms in the waste disposal industry and gangster elements. (Kazuki: 18)

Here again the inadequate Japanese response to environmental crisis can be seen in the planned reliance on 'incineration' as an official form of 'recycling'. The grandly-titled MITI document, 'A vision of plastics waste management for the 21st century', claims to plan towards 90% recycling. But this document is a typical MITI fraud, as no less than 70% of all wastes will be incinerated, with energy recovery becoming the dubious justification for the claimed recycling nature of the process. (*ECN* 27/9/93: 55)

Moreover, this incineration project is now facing increasing public opposition. The wake-up call came in April 1998 when soil surrounding an incinerator in Nosecho, Osaka, was found to have the highest dioxin concentration ever recorded. This particular dispute ended in July 2000 when the incinerator's operator, Mitsui, agreed to scrap the incinerator

and remove contaminated soil at a cost of $6.9 million. (*TT* 24/7/00) Similar discoveries of contamination are assisting anti-landfill campaigns. In May 1997 residents of Nasu employed private researchers to test local streams which were found to be contaminated with mercury, cadmium and lead from local waste dumps. 'Similar tests around the country have sparked hundreds of local protests against improper disposal of both household and industrial garbage.' (*Time* 16/6/97: 97).

Sites for the disposal of incinerator ash are also being opposed, such as the extension to the Futatsuzuka landfill in Hinode which faced a campaign from residents concerned by the health effects of the already existing landfill, including the purchase by 2800 opponents of a site on the edge of the dump to block its expansion. Protestors were finally expelled from this site in October 2000.

This crisis is also creating a new environmental market, with cleaning up toxic waste sites estimated to cost $122 billion (*BsWk* 8/1/01: 22) and rebuilding all the faulty incinerators estimated to cost $66 billion. (*Econ* 25/7/98: 67)

The next stage: Japan goes green

Japan already has a strong environmental protection industry. Having exported its pollution crisis to Asia, it now exports pollution control technology to meet that crisis. As part of its effort to obtain market share, Japan has also begun providing aid for environmental programmes and agencies in Asia. Much of this aid is intended to provide a market for the Japanese pollution control industry: for example, '50% of the 1993 Japanese OECD loan to Bapedal (the Indonesian environmental management agency) of $125 million for pollution abatement was tied to the purchase of Japanese equipment.' (McAndrews: 102)

A report, 'Asia Pacific and the Environment' published by Business International and financed by Du Pont Asia Pacific and PR company Burston Marstellar in 1992, found that Japanese policies placed business profits over environmental conservation in any list of priorities. The report noted that 'although there is a high level of concern about the effects of pollution on public health, little official protection is offered to the natural environment.' State departments charged with monitoring and protecting the environment 'are typically too weak to oppose their more power(ful) economic counterparts.' As for capital, 'Corporations are generally uninterested in environmental problems that lack a tech-

nical solution and from which they cannot make money.' (*Asahi Evening News* 11/9/92)

Of course, Japan's plans are not confined to this level. MITI is already planning the next upgrading of Japanese industry to ecological production. Thus, in MITI's view, the next cycle of accumulation will be based on repairing the damage to the planet done by the previous (and current) cycle of accumulation. Despite the continued chorus of criticism of the environmental impact of industry in Japan, MITI sees Japan taking a vanguard position in saving the environment, and making a healthy profit from it.

MITI's presentation of Japan's industrial and scientific/technological strategy for the 21st century, published in 1990, is as bold as one would expect from the organisation. In broad brushstrokes it outlines the global changes needed over the next hundred years as follows:

> 'The Action Plan devotes the next one hundred years to the recovery of this planet from two hundred years of the accumulation of carbon dioxide and other greenhouse gases.'
>
> 'The first fifty years will be the transition period, when environment-friendly technologies are developed and introduced.'
>
> 'The second fifty years are the years in which future generations will draw on the results of the first half to recreate a green planet.' (Quoted in Burnett: 199-200)

MITI's intentions were further outlined in another 1990 paper, 'The global environmental challenge'. Alan Burnett summarises the gist of the paper as follows: 'Unprecedented levels of economic activity have raised such environmental issues as global warming, depletion of the ozone layer, deforestation. They could pose a major threat to the continued existence and well-being of mankind ... "Sustainable development" will require unprecedented technical breakthroughs in many fields including energy and biotechnology. Accordingly, MITI has initiated a series of research and development projects which will both extend the frontiers of technology and hopefully will lead to new, environmentally friendly industrial technology.' (Burnett: 200)

As Burnett notes, MITI's plans show an excessive faith in the development of new technology. Among the research projects to be initiated is the development of safe nuclear power – a Herculean task likely to be beyond even the capabilities of resourceful and innovative Japanese sci-

entists and technologists. Others include the development of CFC substitutes and biodegradable plastics, while the development of biotechnology is also central to MITI's vision.

These latter technologies – biotechnology, CFC substitutes, biodegradeable plastics, environmentally-friendly technology – are, no doubt purely coincidentally, likely to be at the cutting edge of industrial development and production in the coming century, with the first cited (biotechnology), expected to eventually replace current chemical technology production processes. Thus MITI's great vision of the global environmental agenda is simply its green-shrouded vision of continued Japanese leadership in industrial technologies. As Burnett notes, 'It seems ... likely that the Japanese are looking for a viable formula which will enable them to consolidate further their industrial leadership during the next century.' (Burnett: 204) Behind the greenwash the old Japan reappears.

Notes

(1) The literature on Japanese industrialisation is phenomenally large. Two useful bibliographies are Tsurumi, Y, *Japanese business*, Praeger; and Boger, K E (1989) *Japanese direct foreign investments*, Greenwood. An excellent source on industrial groups and holdings is Ohsono, T (1995) *Charting Japanese industry*, Cassell.

(2) Further information on the importance of female labour for Japanese capital can be found in Brinton, M C (1993) *Women and the economic miracle*, California UP; Roberts, G S (1994) *Staying on the line*, University of Hawaii Pr; Hunter, J (ed) (1993) *Japanese women working*, Routledge; Horton, S (ed) *Women and industrialisation in Asia*, Routledge, pp.134-164; *EPW* 1/6/91: 1415-1422; *Bulletin of Concerned Asian Scholars* 20(3): 42-53; Ward, K (ed) *Women workers and global restructuring*, *ILR* Pr., pp.113-144; *American Sociological Review* 54: 549-564.

(3) For an excellent account of this restructuring see Dore, R P (1986) *Structural adjustment in Japan, 1970-82*, ILO.

(4) This account of the crime of Minamata only scratches the surface of the story. For further information see Smith, W E and Smith A (1975) *Minamata*, Chatto and Windus; Mishima, A (1992) *Bitter sea*, Kosei; *AMPO* 20(4): 40-48; *AMPO* 26(3): 4-9; *New Ecologist* 5: 172-173

(5) On this see the excellent analysis in Apter, D E and Sawa N (1984) *Against the state* Harvard UP.

(6) See Nishimura, H (ed) (1989) *How to conquer air pollution*, Elsevier.

4

Taiwan
Poisoned island

If Japan is the number one economic miracle in Asia, Taiwan is number two: 'The remarkable economic development of the Republic of China in the last forty years has transformed the island into the world's thirteenth largest trading nation with an amassed foreign exchange surplus of some 74 billion US dollars, second only to Japan.' (Feeley: 907) Two years later, on this marker alone, Taiwan topped Japan: 'In 1992 Taiwan had the largest central bank foreign exchange reserves in the world – more than US$88 billion.' (Wilkinson: 118) Economic growth in Taiwan has been phenomenal: 'Gross national product, $151 billion in 1989, has grown at an average rate of 9% per year for the past twenty-seven years and driven per capita income to over 7000 dollars.' (Feeley: 912) This economic growth was guided by the Taiwanese state and supported by aid from the US, which saw Taiwan as an economic bulwark against communist China.[1]

Thus, this industrialisation programme was initiated, on American prompting, by the Kuomintang (KMT) warlords, who saw themselves as a government-in-waiting for the mainland. Following their defeat by the Chinese communists, the KMT armies retreated to Taiwan where they began their occupation by liquidating any opposition to their rule: 'Both Formosan nationalists and communist sympathisers were liquidated, exiled or silenced, and martial law was established.' (Wilkinson: 135) Mar-

tial law was finally dropped only in 1987. Economic development has evolved under the shadow of repression: 'Laws were instituted providing for the mandatory death sentence for those striking or inciting strikes. Further laws restricted freedom of speech, publishing, assembly, association and movement in and out of the country. Definitions of conspiracy, disturbing public peace, sedition and spreading rumours as "crimes against the safety of the Republic" criminalised a host of activities which would normally be considered the exercise of legitimate labour rights.' (Ho: 12)

While Taiwan welcomed foreign capital during its industrialisation programme, foreign capital was not dominant in Taiwanese industry. Between 1952 and 1991 some $12.8 billion was invested in Taiwan through FDI, Japan accounting for 32.7%, the US for 30.2% and Europe for 17.4%. 'The highest area for foreign investment has been electronics and electrical products, attracting 32.5% of the non-services total, followed by chemicals with 25.1%.' (Wilkinson: 122) In the early 1980s FDI accounted for only 15% of total Taiwanese exports. (Wilkinson: 121)

In common with Japan, female labour was of strategic importance in Taiwan's industrialisation. Of Taiwan's approximately eight million workers, three million are women. 'Over half are under 30 and among them, about one-third are under twenty. These women spend the most active years of their lives working long hours in factories and offices, only to find themselves discarded without decent pensions or welfare when they get married or pregnant, or in some cases simply because they are "getting old", and may be slightly slower at work or less pretty.' (Ho: 29) This discrimination is accompanied by strong pay differentials, with women in 1989 earning from 52 to 80% of male wages.[2] (Wilkinson: 139)

Taiwan's industrial development has gone through four phases. The first phase, from 1953 to 1960, involved the development of import substitution industrialisation (ISI), emphasising labour-intensive products such as food, textiles and building materials. In 1953 the state entrusted economic development to the tellingly-named Council for Economic Security which produced a plan promoting glass making, spinning and weaving, synthetic fibres. plastics, and cement. (Taniura: 67)

In the 1960s export-oriented industrialisation (EOI) began, again at the prompting of US advisers, with reforms in Taiwan's third Four-Year Plan (1961-1964), which led to the setting up of three EPZs at Kaohsiung, Nantze and Taichung. Following the 'oil crisis' of 1973, a third phase began: 'The government adopted measures to shift Taiwan's emphasis

from light to heavy industries by promoting capital-intensive industries and the chemical manufacturing sector.' (Feeley: 911) This programme was driven by such Maoist-sounding labels as the Ten Major Development Projects, the Accelerated Rural Development Programme and the Twelve New Development Projects and has been described as ISI in the heavy and chemical industries (HCI).

The fourth phase is currently underway and involves strategic upgrading of industry and a massive infrastructure development programme, similar to Japan in the 1970s. The former resulted from the loss of Taiwan's competitive advantage in most labour-intensive industries, with a massive move offshore by Taiwanese companies, both to SEA and to mainland China. Upgrading industry involves moving into high-tech industries, with major spending by the Taiwanese state on R&D. The 1992 Six-Year National Development Plan envisaged annual per capita income growth of some 7.5%. 'Ten major industries, mainly information and electronics related, but also advanced materials, chemicals, automated machinery and (most ambitiously) aerospace, are targeted for development, as are eight key industrial technologies, including biotechnology and advanced sensing technology, as well as electronics and computer-related applications.' (Wilkinson: 129) Significantly, the list of ten priority industries includes pollution control. (Wilkinson: 137) The other prong of Taiwan's current development strategy is a $300 billion state-led infrastructural development programme.

In upgrading its industry Taiwan has followed Japan's lead in relocating declining sectors offshore, expressed in massive FDI from Taiwan, in certain cases even challenging Japan as number one investor in SEA countries. 'Cumulative totals of Taiwanese FDI between 1986 and mid 1991 were $5 billion to Malaysia alone, and another $3.4 billion went to Thailand and $2.8 billion went to Indonesia. The Philippines was the destination of another $400 million and by May 1992 $743 million was recorded as destined for Vietnam.' (Wilkinson: 128)

The most obvious target of this relocation was across the Strait in the PRC but the KMT government instead developed a 'Look Southward' policy, encouraging companies to locate in SEA, while adopting a 'no haste, be patient' policy towards the PRC. Despite this, much Taiwanese capital entered the PRC, often by indirect routes, mounting to an estimated $60 billion by 2002. Over the last decade the Taiwanese state relaxed its controls but continued to bar companies in strategic

sectors like electronics and chemicals from investing over $50 m per project. These restrictions were finally removed in 2001 in preparation for Taiwan's entering the WTO, and in November and December the state approved 1814 new investment projects for the PRC. (*TT*: 7/1/02)

Industrial structure: giant companies and subcontracting minnows

Small and medium enterprises (SMEs) dominate the economy of Taiwan and are connected in an extensive subcontracting network which, in the absence of large firms and vertical integration, allows production of final products through 'satellite assembly systems'. For example: 'Taiwan is the world's largest producer of bicycles for export, yet has not a single large bicycle factory. Instead there are firms that manufacture parts and others that assemble them to meet a retailer's specifications.' The flexibility and fluidity of these networks is their most advantageous aspect: 'These satellite assembly systems dissolve when the orders stop. The individual firms seek new production orders and form a new satellite assembly system with the next wave of orders. Flexible, undercapitalised and extremely sensitive to market demand, this type of production system creates a sort of capitalism that rolls with market forces and does not attempt to confront them. Several people have called the Chinese industrial system "guerilla capitalism".' (Wilkinson) The undercapitalised nature of these firms also involves drawbacks: essentially, lack of R&D and environmental pollution due to lack of capital to cover pollution control costs. However, it is important to put these SMEs in perspective. SMEs in Taiwan produce only 25% of manufacturing output and value added. (Henderson: 206)

The other component of Taiwan's industrial structure is a small set of massive private and state-owned enterprises (SOEs). In 1990, 10.7% of manufacturing value added was created by SOEs. (Wilkinson: 133) The public sector is concentrated in heavier, capital-intensive areas such as petroleum refining, steel and heavy machinery, as well as arms production. (Wilkinson: 139) SOEs had previously produced synthetic fibres, plastics and electronics.

Growth of the petrochemical sector

For an industry that has to import most of its raw materials, feedstock and 90% of its energy requirements, the petrochemicals industry in Taiwan grew to be a major one, with ethylene output growing from 66,000 mt/yr in 1974 to 852 mt/yr in 1988.[3] (Todd: 34-35)

Taiwan's petrochemical sector has grown 27% a year between 1976 and 1988. (*FEER* 24/11/88: 71) The phenomenal rate of growth in this sector can be seen in the following table:

Table 3: Average rate of growth in chemical sectors 1970-1990

	1970-73	*1974-78*	*1979-84*	*1985-90*	*1970-90*
Ethylene	8.57	51.40	10.84	3.24	17.89
Feedstocks	24.50	49.00	13.90	-0.01	20.30
Plastic mats	20.55	26.42	11.82	10.09	16.89
Synthetic fibre mats	n.a.	73.75	35.92	6.31	28.61
Plastic prods	161.64	15.73	11.42	4.66	18.71
Synthetic fibre	40.36	25.33	11.00	10.11	25.34

(Source: *Chu: 784*)

In 1990 Taiwan became a net exporter of petrochemicals. Two Taiwanese companies, Formosa Plastics Group (FPG) and Synthetic Rubber, are ranked in the top 40 world chemical companies by sales, (*Econ* 13/3/93: 30) while Chi Mei is the world's largest producer of ABS resin, with plants in Taiwan, South Korea and the PRC. (*CMR* 22/1/96) In 1989 the industry's total sales were $48,000 million, of which $20,000 million was exported. In 1988 total petrochemical demand in Taiwan was 6,230,551 tonnes, an increase of 6.5% over 1987. But growth had slowed from 1,160,000 tonnes in 1985 to 601,791 tonnes in 1986 and 378,518 tonnes in 1987. This slowdown was not caused by any decrease in demand but rather due to insufficient supplies. (*CMR* 30/10/89: 3,22)

Taiwan now has larger polyester fibre capacity than all of western Europe, producing approximately 1.2 million tonnes a year. (*ChWk* 12/2/92: 20) By 1994 the industry consisted of 41 major companies, producing over 24 petrochemical intermediates, and three petrochemical complexes. (*C&I* 3/10/94: 771) In 1994 Taiwan produced $5 billion worth of chemicals. (*CMR* 16/10/95: 11)

Petrochemical production began in 1968 when CPC brought its first cracker on stream. The second, third and fourth crackers went on stream in 1975, 1978 and 1984. Some of the first pioneering ventures were joint

ventures between local and US capital. Taita Chemical, which opened its first plant in Kaohsiung in 1965, for example, was a joint venture between Mobil and local interests. Similarly, China American Petrochemicals is half-owned by Amoco. (Todd: 36)

Petrochemicals is one of the main industries in Taiwan to have attracted FDI: 'From 1952 to 1990, two sectors are the dominant receivers of foreign capital, namely the manufacturing of electric and electronic products, and chemicals.' The former received 23.7% of FDI and the latter 19.9%. (Alverstam: 79) However, many chemical sectors became bastions of local capital: 'The Taiwanese plastics industry in particular has almost no history of direct capital participation by foreign business.' (Taniura: 76-77)

Petrochemicals is an important industrial sector, not only in itself, but also for its downstream effects: 'The petrochemical industry accounts for 20-30% of Taiwan's GNP. Thousands of downstream manufacturers rely on its products.' (Williams: 199) These downstream employment effects are significant: 'As a progenitor of a downstream sector which accounts for 641,000 workers in 1981, fully 34.5% of Taiwan's industrial workforce, the existence of a basic petrochemicals industry enjoys a significance far out of proportion to the number of workers active in it.' (Todd: 39) According to Ho, 'The plastics industry contributes about one-third of Taiwan's GNP and employs one-third of the manufacturing work-force. FPG alone has contributed 4% of Taiwan's GNP in recent years.' (Ho: 92)

The industry is centred around the port of Kaohsiung: 'Kaohsiung's share of the ethylene output amounts to 94% of the island's total, its share of propylene is 92%, while its share of butadiene is 100%. As far as aromatics are concerned, it has cornered 63% of the production of benzene, 98% of the production of toluene, and 72% of the production of xylene. The city also commands the bulk of Taiwan's midstream output as a concomitant to its commanding share of upstream activities.' (Todd: 35) Taiwan's industrial planners have designated only five lucky areas as recipients of petrochemical development, three at Kaohsiung and one each at Taoyuan and Toufen.

Structure of the petrochemicals industry

Taiwan's petrochemical industry involves a mixture of state and private firms. 'China Petroleum Co, a SOE, monopolises refining and cracking, while the immediate downstream products – rubbers, synthetic res-

ins and fibres – are produced oligopolistically by two or three large firms, both SOEs and private companies, while the final products sector involves a great number of very small manufacturers [who] are caught up in an atmosphere of friction-filled competition ... The level of competition becomes fiercer and fiercer and profit margins become thinner and thinner as processing proceeds downstream.' (Taniura: 72)

Despite *laissez-faire* fantasies, the state played a central role in this development. 'The state played the role of entrepreneur, investor and organiser in the initial stage of development. Other policy tools were also used, such as trade controls, selective credit allocation, tax incentives, and land allocation. When the whole industry was almost nonexistent, when private capital was weak and unable and unwilling to undertake the project and bear the risk, the state planned the project, built and operated the naphtha cracker itself, organised Sector II's operation, and groomed a group of private investors for the task.' (Chu: 785)

While the state opened the naphtha-cracking sector to the private sector in the mid-1990s, it continues to provide support for the industry. Critics of CPC's proposed naphtha plant at Chiagi attacked 'the government's provision of subsidies for water, electricity and land requisition'. (*TT* 8/12/99)

Formosa Plastics Group

One of the private investors handed a section of the plastics industry was Wang Yung-ch'ing. Originally involved in the lumber industry, Wang moved to plastics in 1954 when he hounded Formosa to produce PVC with $500,000 capital of his own and $670,000 of US aid. Facing suspicion among downstream users, Wang set up his own downstream processor, Nan Ya Plastics, to process and sell Formosa's PVC. Wang's creation has grown into the Formosa Plastics Group (FPG), which dominates not only the plastics sector, but also the Taiwanese private sector. FPG's rise from humble origins has been miraculous: 'Between 1971 and 1980 the FPG's total assets grew from 8.8 billion to 58.2 billion NT dollars, an increase of 660%.' (Taniura: 74) In 1989 FPG had worldwide sales of $6 billion, $2.05 billion of which was accounted for by its Nan Ya plastics subsidiary. (*CMR* 5/6/89: 4) Now the world's largest PVC producer, FPG was the 47th largest chemical company in the world in 2000, with profits of $882.4 m on sales of $4881 m, these latter having increased 73% since 1995. (*CEN* 23/7/01) Wang's personal wealth was estimated at $2.7 billion by *Forbes* in 2001.

As mentioned above, FPG is a massive producer of intermediate goods for downstream processing industries: 'The FPG is involved mainly in the sale and manufacture of synthetic fibres, plastics and plywood, and occupies the top position in each of these industries in Taiwan. Furthermore, in its plastics business the Group boasts the world's largest-scale operation, rightfully deserving the name "King of Plastics".' FPG produces over 70% of Taiwan's PVC and HDPE, 45% of PP, 95% of rayon staple and 70% of acrylic staple. (Taniura: 63)

FPG's operating methods have been well summarised as 'vertical integration, big product volume and state-of-the-art automation'. (*BsWk* 15/8/94: 26) While independent of foreign capital, it is dependent on foreign technology: 'For every new sector that it enters or product that it releases, the Group has received some form of foreign technological assistance.' (Taniura: 77). While FPG devoted itself to cost and quality control, it neglected R&D until 1986 when it finally set up an R&D centre. With R&D costs of around 1% of gross sales, FPG continues its history of 'disregarding internal corporate research and development and growing exclusively on the technological achievement of other enterprises.' (Taniura: 87) FPG has expanded internationally to secure access to cheap and reliable sources of feedstock, as well as in response to popular opposition (*see below*).

Industrialisation = environmental crisis

Taiwan's industrialisation was intimately connected with petrochemicals development, inevitably leading to an environmental crisis. Costs of pollution control and environmental cleanup over the next decade have been estimated at between $10-70 billion. (Williams: 205) The Taiwan Environmental Protection Agency (EPA) is reported to be aware of 8000 industrial enterprises that are causing environmental problems. Of Taiwan's 21 major rivers, 30.6% are either moderately or heavily polluted, according to EPA data. (*FEER* 29/10/92: 38) Another source reports that 90% of Taiwan's 21 rivers are seriously polluted. Professor Yu Yue-hwa of National Taiwan University says, 'Supplies of water for nearly two million people in Kaohsiung are really bad and the local people use only bottled water ... In the north, Taipei's Tan-Sui River is a gutter, full of trihalomethane, other chlorinated organic compounds and volatile organic compounds. Taipei and Kaohsiung are beyond our help.'[4] (*PanosScope* July92: 6) (*TT* 4/4/02) A report from the Academica Sinica group, *Taiwan 2000*, notes, 'Facilities to protect humans and nature from

the toxic, mutagenic, carcinogenic, insanitary and generally dirty and unpleasant consequences of industry are at best primitive.' (*FT* 10/10/89: 42)

Industrialisation has had a major effect on the food supply. 'Taiwan which, in the colonial period, exported half its rice to Japan, is no longer self-sufficient even in food.' (Arrigo: 32) This has resulted partly from the conversion of agricultural land to industrial and residential uses, while the land itself is being poisoned by both industrial and agricultural practices: 'In 1988 a soil survey indicated that 12.5% of all arable land has high concentrations of heavy metals, and this figure is projected to double by the year 2000. Agricultural use of pesticides is 11 kg per hectare, triple the amount used in the US.' (Feeley: 915)

This development is taking its toll on health. The incidence of cancer, Taiwan's leading cause of death, has doubled over the last three decades, while asthma cases in children have quadrupled over the last decade. (Bello: 202,204)

This 'development-at-any-cost' attitude meant that 'little if any attention was paid, through formal regulations, laws or even guidelines, to protecting the quality of the environment. Taiwan became well known, if not notorious, as a haven for so-called dirty industries as petrochemicals. As other countries adopted more stringent restrictions on such activities, the attraction of Taiwan increased as a place for such investments.' (Williams: 195)

Capital's attitude is, as always, to minimise costs. 'In Taiwan, most companies have to be forced to take adequate pollution measures,' according to George Wei of Du Pont. (*FEER* 21/9/89: 83) Here again, Taiwan's industrial structure is crucial: 'Small enterprises cannot afford adequate anti-pollution equipment, and illegal companies simply do not bother. Even companies with scrubbers, filters and more sophisticated pollution control equipment tend to turn off the machines at night to save money. The Bureau of Air Standards estimates that 9000 factories are in violation of emission standards.' (*FEER* 19/9/91: 42) Companies similarly try to get around pollution regulations: 'Many companies, for example, reroute effluent pipes up to three kilometres away from their factories to escape detection.' In 1995 the EPA identified 2183 factories in Kaohsiung as causing pollution. 'However official figures seriously underreport the problem. The above-mentioned factories are only the registered pollution-causing factories. Four times as many unregistered "underground factories" are also operating.' (Wang: 123)

Taiwan's industrial structure, so beloved of the neoliberals, contributed directly to the development of this crisis. As the *Economist* noted, 'Well over 90% of Taiwan's businesses are small concerns with neither the money nor the desire to invest heavily in environmental controls.' (*Econ* 15/7/89: 58) It is well known that regulation of medium-sized operations is difficult: 'With their profits dependent on reducing as much cost as possible, SMEs have largely disregarded the government's weak waste-disposal regulations and dumped industrial waste into the nearest body of water, placing it directly in the food chain. Twenty percent of farmland, the government admits, is now polluted by industrial waste water.' (Bello: 201) This attitude affects occupational safety and health in the same way as it does environmental pollution.

The petrochemical industry has a major environmental impact, leading to continued public opposition. CPC is reported to have had eight major industrial accidents in the Kaohsiung area from 1996 to 1999, while two of its crackers were closed on environmental grounds. In April 2002 EPA reported groundwater in Kaoshiung was contaminated with benzene from Grand Pacific, Taiwan Styrene Monomer and two CPC plants.

Occupational safety and health

If the environment was grist to the mill of Taiwanese industrialisation, so also was the health and safety of the island's workers. In 1980 deaths at work were estimated at seven times the level in England and four times the level in Japan. Only in 1985 did the state expand industrial inspection to all mines and factories employing over thirty workers. Given Taiwan's industrial structure, with 86% of Taiwan's firms employing less than thirty workers, a large proportion of industrial workers is not covered by the legislation. In addition, it is of course ineffective as, despite inspections, safety violations often remain uncorrected: fines are small, and legal action rare. 'In 1990 a total of 3358 establishments received an inspection in connection with the Labour Standards Law of which only seventeen violating firms were sent to court; 821,602 enterprises received a safety and health inspection, of which only 212 violating firms were sent to court.' (Kao: 12) The state wishes to educate employers, rather than to coerce them to improve safety. The inspections are sometimes undermined by corruption: 'Cases of corrupt factory inspectors taking bribes and falsifying reports have come to light after some major accidents had necessitated inquiries.' (Ho: 25)

In this area also, official data are misleading and contradictory. 'According to a report of the Industrial Inspectorate, 6816 accident victims were recorded in 1985, of whom 203 were killed and 190 disabled. In contrast, the Labour Insurance Scheme registered 29,167 victims, of whom 1341 were killed and 5256 disabled.' (Ho: 25) As the same author summarises, 'Most cases of work-related illnesses go undiagnosed, unreported and uncompensated.' (Ho: 26) A more recent report from National Taiwan University experts summarises the situation cogently: 'An average of one to two thousand male workers in Taiwan sustain work related disabling injuries annually; also, the annual mortality rate of male workers due to occupational injuries is about 0.5/thousand. The risk of major occupational injuries among female workers is about one-sixth that of male workers and has not shown any tendency to decline in the past six years. The total mortality due to occupational injuries in Taiwan is five to ten times higher than that of more industrialised countries such as Japan or the US.' (Liu: 138)

Growth of opposition

In the 1980s a strong movement emerged in Taiwan in response to its environmental crisis. NGOs began to proliferate, such as the Consumers' Federation of the ROC, Society for Wildlife and Nature, Taipei Wild Bird Society, the National Parks Association and others. These represent the 'official' environmental movement in Taiwan, with its base mainly in the middle class, following a programme of public education and persuasion. By contrast, the final element of Taiwan's environmental movement arose when local residents began to react, often violently, against environmental abuses that directly affected their health, income or quality of life.

This was accompanied by a change in public attitudes to economic development. Pollution moved from sixth to second most serious social problem in opinion polls between 1983 and 1986, and from fourth to first in social problems expected to grow worse. Some indication of the popular mood can be gleaned from the fear expressed by a teacher in Lukang: 'At first, economic development covered only our ankles, and we wanted more. Now, it is up to our waists, and many people feel they have enough. What we fear most is that we'll find ourselves up to our necks in development, and then it will be too late.' (Reardon-Anderson: 13)

This change in attitude was most obvious in those areas afflicted by industrial pollution: opposition bloomed. Already in 1978 Taiwanese

scientists were reporting the existence of environmental conflicts. 'Conflicts between fishermen and industries have arisen along the Chi-Shui river because fish yields have been adversely affected by industrial wastewater pollution.' (Kao: 125) The first local response was to use the court system against polluters: in 1981 the first suit was taken against local brick manufacturers for damage caused to rice paddies in Hua-Hn Village. NT$1.5 million ($375,000) in damages were awarded to the peasants bringing the suit. In the period 1979-1982, 'Eight steel mills in Taipei were relocated or forced to stop operations.' (Wang: 130)

By 1983 the response of local residents affected by industrial pollution escalated to involve violent direct action. 'In 1983, residents of Linyuan, near Kaohsiung in southern Taiwan, burned down an amino acid factory that had been polluting the air and water of their village, forcing the factory to move to another site. In 1985 threats of violence against pesticide plants in Hsin-chu and T'ai-chung counties led the management of both factories to agree to clean up their operations. Similarly in 1986 citizens in Taichung formed a committee that succeeded in shutting down a chemical plant that was polluting the county.' (Bello: 212)

The most famous of these struggles occurred in October 1988 when nearby villagers forced the closure of the Linyan Industrial Zone in Kaohsiung County for four days. Villagers claimed that accidents over the previous decade had polluted the coast and ruined their income from fishing. The citizens took direct action when negotiations failed to persuade management at the complex to stop dumping toxic waste that was destroying the fishing industry. (Bello: 212) Demonstrators are reported 'to have tried to close valves and shut off pipes and to have been stopped only by bodily intervention by plant employees.' (*FT* 10/10/89: 42)

Losses caused by the four-day closure reached $200 million. In response, the government forced the companies to pay compensation for lost income to the villagers, while at the same time giving the companies a one-year period in which to modify the zone's water treatment plant. (Williams: 199) This policy of making compensation payments to locals to buy silence, though not without its critics, both in the environmental movement and among the petrochemical industry, was continued by the government. (*See* Todd: 36) In February 1989, 200 fisherfolk in Kaohsiung port marched in protest against water pollution caused by the state oil company, demanding compensation of NT$7 billion. (*Econ* 15/7/89: 57)

In September 1989 ICI closed its Kaohsiung Monomer plant following complaints by fisherfolk that waste acid was being dumped near the coast. ICI claimed the acid is quickly neutralised by salt water and refused to accept compensation claims of £24 million. The factory, which is 60% owned by ICI and 40% by China Petrochemical Development Corporation, an SOE, had been producing 35,000 tonnes of MMA for ten years. ICI had begun an expansion programme to double output at the factory with an investment of $100 million, half of which was earmarked for disposal of the surplus acid without sea dumping: the equipment would not be ready until the beginning of 1990. This incident did not destroy ICI's appetite for investment in Taiwan: in July 1989 it announced plans to invest $300 million in a TPA plant. (*FT* 25/9/89: 4; 10/10/89: 41)

The Taiwanese people have learnt that protesting brings results. With an average of one anti-pollution demonstration a day in 1987-1988, Taiwan's environmental movement continued to grow in strength. The protests mentioned are simply the highlights. Hsaio estimated in 1988 that 108 anti-pollution campaigns were waged between 1981 and 1988, with the number greatly increasing after martial law was lifted in 1987. Between 1988 and 1991 Hsaio recorded 352 incidents of confrontation over environmental issues. (Hou: 4-5) From 1988 to 1995, Wang estimates, some 259 serious pollution conflicts occurred, with industrial areas accounting for a third of the conflicts, and the three major targets of campaigns being chemical factories, landfills and power plants. (Wang: 135) Another analyst speaks of seven major campaigns over the period 1984 to 1992, of which four blockaded roads leading to factories, three occupied factories and used non-violent methods such as switching off power supplies. (Kuo: 80)

In June 1989 a demonstration at CPC's Lin Yuan refinery, in protest after CPC refused to pay compensation and instead proposed a clean-up operation, led to injuries to scores of protestors and riot police. (*FT* 13/10/89) In 1991 protesters at the Lin Yuan petrochemical zone near Kaohsiung accused China General Plastics Corporation of using second-hand imported equipment which led to environmental pollution, an accusation denied by CGPC. (*FEER* 25/7/91: 62)

When pollution from a nearby petrochemical complex at the beginning of May 1993 affected residents of Ta-she Township, Kaohsuing, they protested. 'On 1 May 1993 one thousand residents blockaded the area and settled in for a long siege after their demand that the offending plants

agree to move out within ten years was rejected. They were further surrounded by four hundred policemen.' (Arrigo: 35) On the third day of the blockade the Minister of Economics came to negotiate with the residents: the eventual compromise involved relocation of plants in twenty-two years and various ameliorative measures.

As well as attacks on operating industries, opposition to proposed developments increased. One of the most well-known struggles involved the blocking by residents of plans by Du Pont to produce titanium dioxide at Lukang, Changhua County. This plan was blocked by a major local campaign. Du Pont eventually relocated the plant to Kuanyin Industrial Zone in Taoyuan. (Williams: 198; Reardon-Anderson) In 1998 Bayer abandoned plans to build a TDI plant at Taichung after four years of opposition by an 'anti-Bayer league' had repeatedly delayed the project. The start of construction was already eighteen months behind schedule when the government decided to make approval contingent on a public referendum. Instead Bayer decided to build the plant in Baytown, Texas. (*ECN* 23/3/98: 55)

The strength of the Taiwanese environmental movement can be seen in the failure to commission any crackers at all in Taiwan in the late 1980s and the early 1990s. In 1987 there was strong opposition at Houchin in the Kaohsiung area to a CPC plan to add a fifth naphtha cracker to its plant there, which led to a promise by CPC to instal pollution control measures. Also in 1987 Formosa Plastics' plan to build another cracker in Ilan ran into opposition, leading to Formosa switching its location to the Kuanyin Industrial Zone in Taoyuan. (Williams: 198; Todd: 36) The intensity of opposition to the CPC crackers is shown by reports that local residents threatened mass suicides. (Feeley: 916-917)

In December 1990, over 20,000 people demonstrated in Taipei and Ilan County to protest against Formosa's proposed $7 billion chemical complex, (*MM* May 91: 7) Taiwan's sixth cracker, being built on reclaimed land at Mailiao. This cracker is actually a huge complex, built on 6400 acres of reclaimed land: 'About as large as Singapore's entire chemical industry, the complex will make Taiwan self-sufficient in a whole range of industrial chemicals.' (*CEN* 5/10/98: 27) This cracker faced 150 demonstrations and was delayed fifteen years. With the first cracker at the complex due to go on-line in October 1998, citizens in early September were preventing the erection of pylons to supply power to the complex. 'The problem was solved on 13 September when the government sent 700 police officers to protect the erection of the pylons.' (*CEN* 5/10/98: 28)

Tuntex's seventh naphtha cracker, planned as part of the Binnan Industrial Complex and listed by the Ministry of Economic Affairs in 1993 as an essential national project, still had not successfully overcome opposition in December 2001, while the Meinung dam, intended to supply water to the complex, also ran into major opposition. In December 2001 EPA officials said the EIA would not be completed until further information was supplied. (*TT* 20/12/99;25/4/00;20/12/01)

Even when local agreement is available and a new plant is constructed, its operation can be halted by environmental opposition. In June 1995 Formosa Chemicals and Fibres Corporation (FCFC) commissioned its new ABS plant. The following month, following complaints from local residents over emissions from the plant, FCFC was forced to shut the ABS plant for two months to upgrade its emission system. (*ACN* 31/7/95: 5)

Environmental interests have also succeeded in obtaining local political power. As one example of success at the local level, 'In 1981, when the ruling Kuomintang (KMT) brooked no opposition at all, a group of independents in Ilan, an industrial county in eastern Taiwan, ran for local government and won ... The Ilan administration has set up its own Environmental Protection Department, which has shut down some polluting factories and fined and enforced clean-air regulations on others. It halted plans to build a $9 billion naphtha-cracking complex that the central government had said was essential to the island's industrial development.' (*Newsweek* 9/5/94: 42)

While academics have described the 1980s protests as mainly local in scope and close to NIMBY, with 88% of protests initiated, organised and participated in by local victim residents, and only 12% involving participation of outsiders, (Hou: 3) Hou claims that 'a new form of environmental activism has emerged in the 1990s, involving a combination of grass roots mobilisation, increasing involvement of professional activists and scholars, linkage between environmental and social issues, entrepreneurial politics and articulation of visions of alternative development,' (Hou: 8) citing the anti-Binnan movement and the Meinung Anti-Dam Movement as examples. Others claim the groups are abandoning direct action: in 1993 a survey by Kuo found only 6% of environmental groups organised sit-ins and only 4% organised demonstrations. (Kuo: 80)

Environmental regulation: The state responds

The Taiwanese state has been forced to move in response to popular protests. In 1982 the Bureau of Environmental Sanitation was transformed

into the Bureau of Environmental Protection and in 1987 this was elevated to cabinet level as the Environmental Protection Agency. Funding for the EPA increased from NT$6.15 million in 1987 to NT$154 million in 1990, (Feeley: 917) while EPA inspection staff increased from 250 to 900 in September 1989. (Feeley: 919) Critics denounce the EPA as a purely PR exercise which is in no way able to deal with Taiwan's serious environmental problems.

Representatives of capital have admitted that the EPA is unequal to the job it has been set. Ronald Hesier of *BP*'s environmental services subsidiary said, 'The EPA has teeth, but they're the teeth of an eighteen-month old baby and right now the problems require the teeth of a sabre-toothed tiger.' If Taiwan waits too long before taking action, according to Hesier, 'it could become a dumping ground for technologies that are too dangerous to carry out in other countries.' (*FT* 13/10/89) Despite Feeley's report of 900 inspection staff, it was reported in 1992 that the EPA had only 238 inspectors. (*FEER* 29/10/92)

The failure of the EPA became clear in a short time. Some 1400 people received hospital treatment in March 1990 when chlorine leaked from the Chungchou waste treatment plant in Kaohsiung, 'but it was not until after 400 residents stormed the facility a few weeks later that the authorities moved – not to shut down the plant but to levy a small fine of $5,800.' (Bello: 213) Similarly, 'In another instance, the authorities allowed a battery-recycling firm to remain open for months, even after a study discovered that half of its employees had contracted lead poisoning and kindergarten children nearby had developed mental disorders. In ten years, only ten plants have been shut down. Those that receive citations from the EPA often ignore the fine and go on polluting.' (Bello: 213)

Feeley's description of environmental regulation in Taiwan in a 1990 article provides a litany of the Taiwanese government's failure to act: 'Accidents involving PCB poisoning have highlighted the danger (of hazardous waste) but so far the government has *taken little action to address the issue. In 1987, the Executive Yuan approved a revised short-term control measure on industrial wastes which included such hazardous wastes as PCBs, heavy metals and pesticides; however, little appears to have resulted from this action. In addition, the EPA has promised (but not yet acted) to set up a hazardous waste control system, and to issue licences to state-owned and private waste clearance and disposal companies. The general plan which the EPA has formulated to prevent toxic chemicals from endangering public health is for the most part still on the drawing board.*' (Feeley: 927-928; emphasis in

original) While detailing EPA's concerns on water pollution, Feeley notes, 'The EPA's policy is still principally involved with gathering information and creating data banks as a prelude to promised action.' (Feeley: 923)

Part of EPA's problems have stemmed from failure to pass the Environmental Protection Foundation Law, first introduced to the legislature in 1988 and still stalled, due to business opposition, thirteen years later. (*TT* 11/1/02)

Little as it is, regulation has been strongly attacked by capital as affecting industrial competitiveness. The head of the EPA told the *Financial Times*: 'Business executives complain that environmental rules are too harsh, increase costs and place them at a competitive disadvantage in the world market.' (8/10/93: 31) The EPA has also been beset by bureaucratic political problems: disagreements with the Industrial Development Bureau, a department of the pro-business Ministry of Economic Affairs, have helped cripple regulation. 'On account of political battles between the IDB (which sides with industry) and the EPA (which is insisting upon compliance with more stringent emission value limits), the practical enforcement of environmental regulations is proving difficult.' (*EBB* 302: 9)

While environmental regulation has failed to deal with environmental problems, it has led to a flourishing market for pollution control. In 1992 Taiwan spent over $22 billion on environmental protection, a level of spending expected to continue over the next five to six years. (*FT* 8/10/93: 31) The market for environmental technology is expected to grow 1.5% faster than general economic growth, while some 600 companies are now active in the environmental sector in Taiwan.

Despite these impressive plans, it is worth noting cynicism as to how many will actually be implemented. Even in cases where plans are implemented, the spending may not all go to environmental protection. The *Economist* recently reported on one scandal involving the CPC: 'The case seems to be fairly typical of the Taiwan construction industry. Brown and Root International (BRI), an engineering firm based in Houston, Texas, won a $173 million contract in 1991 to build a waste-water treatment plant for a CPC refinery. BRI subcontracted the project to Tang Eng Iron Works, a state-owned company, allegedly with the collusion of an array of CPC officials, sub-contractors and KMT politicians, for $130 million. The difference of $43 million is said to have been divided up among the parties to the deal.' (*Econ* 12/6/93: 43)

Exporting hazards

Public opposition, combined with other factors, is leading to a major restructuring in the industry. To look at the wider context, the NEA NICs, towards the end of the 1980s, began to see major problems emerge for their economies, 'including labour shortage, rising real wages, currency value fluctuations, as well as increasing land and raw-material costs. In thus pushing up production costs, these elements are reinforced by rising demands from labour unions and environmental protection regulations.' (Tsay: 111)

These changes have affected the petrochemical industry in Taiwan. To begin with, some of the industry's major customers have moved offshore. One example of this export can be seen in the joint venture agreement between the Taiwan Toy Industry Association (TTIA) and the Zhejiang provincial government to invest $200 m in an economic development zone in Yuyao, where PRC authorities are setting up the China Plastics City. Some forty factories have already relocated to the city. In July 1995 TTIA confirmed that a further 120 plastics processing factories would relocate to Yuyao from Taiwan, Japan and western Europe. (*ACN* 17/7/95: 4)

As Bello and Rosenfeld observe: 'Stymied by continuing citizen protests, the petrochemical companies have begun to locate elsewhere: Formosa Plastics is considering China as the site for its naphtha cracker; USI Far East has chosen the Philippines; and Du Pont is setting up its titanium dioxide plant in Korea, after some strong-arming of the government there by Washington.' (Bello: 214)

The export strategy is confirmed by an examination of capital outflows from Taiwan. Examining figures up to 1982, Esho noted, 'Taiwan's investment pattern is centred on manufacturing. The chemical industry is the largest investment field within the manufacturing sector with 30.8% of total investments, and 36.6% of those in manufacturing.' (Esho: 19) It is worth noting here that 'data pertaining to DFI (direct foreign investment) outflows from Taiwan are inaccurate and grossly understate the actual amount of foreign investment ... the actual DFI outflows are probably twenty times more than the official figures show.' (Tsay: 116-117) Yet the official figures are impressive enough. Between 1985 and 1990 approved outward chemical FDI was $535 m, of which $353 m went to the US, $100 m to the Philippines, $76 m to Malaysia and $2 m to Thailand, according to the OECD Development Centre. (Paper 61) These

figures are for the chemicals industry. The majority of this investment would be in the plastics sector: 'During the period between 1986 and 1990, DFI from Taiwan in plastic and rubber products became increasingly significant, accounting for 30% of the total amount of DFI in manufacturing.' (Tsay: 118)

In 1994 CPC closed down its second naphtha cracker in Kaohsiung when it brought its fifth cracker on-line in the same area. According to a CPC spokesperson, the reasons were environmental: 'If we operate both crackers, the total pollutant amount would have exceeded the level which we had promised to the Kaohsiung neighbourhood.' (*ACN* 28/8/95: 18) In August 1995 CPC announced plans to shift the cracker to Indonesia and establish an associated downstream petrochemical complex with Taiwanese companies. The following month CPC confirmed the cracker would be relocated to Surabaya in west Java, with production from the cracker to begin in 1998. This complex was to be CPC's first offshore petrochemical production. (*ACN* 25/9/95: 24)

The move abroad is likely to be accelerated by the ban on new projects and expansion of existing projects introduced in April 1996 by Kaohsiung county in response to complaints of local residents about pollution. The ban affected 10 proposals. (*ACN* 22/7/96: 5)

Moving into the PRC

While the PRC seemed most closely available, the state adopted a no-haste policy in 1996 to prevent Taiwan becoming overly dependent on the PRC. Until 2001 it banned any investment over $50 m, and in January 2002 was still negotiating with the Petrochemical Industry Association of Taiwan (PIAT) over the conditions under which it would allow strategic investment in the PRC. There are more attractions to the PRC than cheap labour and lucrative markets, a PIAT executive explained: 'Taiwanese petrochemical companies would need to transfer manufacturing to China to avoid thorny problems they are facing at home, such as expensive land costs and protests from citizens over environmental pollution.' (*TT* 12/9/00)

FPG has constantly argued for investment in the PRC. In 1989 FPG announced plans for a $6 billion complex in Haicang, Fujian, but abandoned the plan in 1992 in return for the state selling FPG land for a cracker at Mailiao, reportedly at one-third the commercial rate. (*TT* 24/6/01) By May 2001 FPG already had fifteen major investments in the PRC, including nine operated by Nan Ya. (*TT* 29/5/01) In February 2001

FPG announced plans to invest $300 m in four new PRC PVC plants and in May announced a $5 billion complex in Ningbo, Zhejiang, and intermediate investment of $293 m there. The company argued that to maintain its leading role in the industry it had to invest in the PRC as all its major competitors were investing there. FPG is currently negotiating with the Taiwan government over these plans. (*TT* 29/5/01) Meanwhile, in January 2002, Nan Ya announced plans to invest a further $270 m. (*TT* 4/102) The PRC had offered FPG generous incentives, reportedly granting the Ningbo project an extra 2000 hectares of land in 2001 (*TT* 24/6/01), a five-year income tax exemption after the plant turns a profit and a further five years with 50% tax reduction. (*TT* 12/9/00)

Re-exporting hazards to the North

One of the ironies of the Taiwan story is that an important section of Taiwanese toxic capital decided to relocate in the North, primarily in the US. Much of this investment began during the Reagan regime when environmental and occupational safety and health regulation and enforcement were under assault by his Vice-President Bush, a representative of not only national security, but also oil and pharmaceutical interests.

These moves into North America have included joint ventures, one, for example, with Union Carbide, the butchers of Bhopal, which announced in November 1990 a new CAN$350 million ethylene glycol factory at Prentiss, Alberta, Canada, in a joint venture with Far Eastern Textile (Taiwan), Mitsui (Japan) and Oriental Union (Taiwan), the output of which will principally supply Far Eastern polyester markets. (*CMR* 12/1/90: 3,16) Similarly, in January 1989 Westcoast Energy Inc, a Vancouver-based utilities company, announced plans to set up an ethylene cracker with five companies from Taiwan involved: Tuntex, Central Investment Holding, Nan Ya, Shinkong Synthetic Fibres and Taiwan Synthetic Petrochemicals. At least half the derivatives output would be destined for export to Taiwan. (*CMR* 16/1/89: 5))

The major Taiwanese investor in the US has been FPG and its various subsidiaries. Formosa opened its first plant in the US in 1980. Since then it has continued to expand. In November 1988 FPG announced it would invest a further $1.3 billion at Point Comfort, the largest single petrochemical investment in Texas history (*CMR* 7/11/88: 5) and the largest petrochemical development built in the US in a decade: the plant, to be built in an area with 15.8% unemployment, has received close to

$170 million in tax breaks and subsidies. (*MM* May 91: 7) About a third of all production at Formosa's Point Comfort plant will be exported to Taiwan. (*ECN* 9/8/93: 32) Since then, FPG has announced further plans for US production. In September 1995 the company announced board approval for a new $500 million 680,000 tpa plant to be built at its Point Comfort complex. (*ACN* 25/9/95: 4)

In June 1989 FPG announced plans for a $200 m polyester fibres unit on 600 acres in Flake City, South Carolina, with a capacity of 400 million lbs, expected to be on-stream in 1991. (*CMR* 5/6/89: 4) In January 1991 FPG announced plans for a $700 million viscose rayon plant near Wallace, Louisiana. (*CMR* 28/1/91: 3,46) Nan Ya announced plans for a PET resin factory to come on-stream in 1995 at Lake City, South Carolina, where the company is already building a PE factory. (*CMR* 25/1/93: 4; *ECN* 2/8/93: 25)

FPG also expanded into North America through acquisitions, in 1992 purchasing J-M Inc, which has grown to be the world's largest manufacturer of PVC pipe, with fourteen plants throughout the US, and buying Stauffer's Delaware City plant the year before.

This move north is continuing. In June 1995 FPG confirmed it was considering building a second world-scale naphtha complex at its Houston, Texas, petrochemical site. In April 1995, another Taiwanese-owned group, the Westlake Group, announced plans to build a world-scale ethylene plant on the US Gulf Coast. (*ACN* 26/6/95: 21)

This expansion in the US was not without its problems, however. In October 1992, Formosa abandoned plans to build its Wallace, Louisiana project. Another Taiwanese company, Che Me, scrapped plans for an ABS plant in Texas due to the prospect of a lengthy permitting process and threatened picketing by local environmentalists. 'The firm, which began this project in 1989, has been beset for years by steep fines from myriad state and federal agencies for various violations, and lawsuits from the Attorney General of Texas, environmental groups and individuals claiming injuries and other problems.' (*CMR* 23/8/93: 14)

In February 1991 Formosa Plastics Corporation, Texas, agreed to pay $3.4 m for violations of federal hazardous and solid waste law at its Point Comfort, Texas, vinyl chloride complex. In October 1990 the EPA charged that Formosa had contaminated soil and groundwater with hazardous liquid and solid waste beginning in 1988. The EPA complaint also claimed that 'Formosa did not have a hazardous waste analysis plan,

did not properly identify hazardous wastes, and did not have a proper operating plan or secondary catchment for storage tanks in case of spills.' (*CMR* 4/3/91: 3, 23) Formosa's Louisiana plant has been fined several times since 1987 for excessive vinyl chloride releases, while in 1986 a Delaware judge ordered a six-week shutdown of a Formosa plant after a massive VCM release. (*MM* May 91: 7) FPG generates over 194 m lbs of toxic waste annually in the US, over 1 m lbs of which is discharged directly to air, water or land.

Toxic waste

An EPA survey in 1985 estimated that 30 million tonnes of industrial waste are generated in Taiwan, of which 12.9 million tonnes are hazardous. While industrial waste regulations were enacted in 1989, due to the lack of commercial facilities they could not be enforced, as many industries had no place to send their wastes. In 1993 RSEA, an SOE, announced plans to build a toxic waste centre in Kaohsiung. According to an executive with RSEA, 'Generators of hazardous waste usually have their waste removed by waste transport companies, but seldom care about the final disposal of their wastes.' When the waste centre is operating, the EPA is to require its use to treat industrial waste, but Dr Liang has said, 'Enforcement of the regulation is somewhat in question at the present time.'

Current practice in toxic waste disposal is still unsatisfactory, to put it mildly. A survey of waste disposal by Taiwan's 200 leading enterprises (which would, presumably, be the sector most likely to exercise some restraint in waste disposal, compared to smaller companies) found that 70% of them were 'abusing the environment'. (Williams: 203) Recently there has been a growth in the illegal midnight dumping of wastes. According to Williams, the disposal of toxic wastes is 'one of the most serious hazards facing Taiwan. Environmental officials frankly admit that they have no idea how much of this kind of waste is going into the soil and water.' (Williams: 205-206)

Major problems for the future from chemical time bombs are predicted: 'There is a high probability that problems from hazardous wastes will increase rapidly in the 1990s and after, as storage containers break down and the latency periods for human health problems, such as cancer, are exceeded.' (Williams: 190)

While all of Taiwan's solid waste – currently running at 30 million tonnes annually – is buried, the present Six-Year Plan intends that 21

incinerators, including a pilot industrial waste incinerator, be built by 1996. (*FEER* 19/9/91: 42) The first garbage incinerator in Taiwan began operations in May 1991.

However, an environmental industry journal noted in 1996, 'Like in many Asian (and also southern European) countries, there is a discrepancy between planning and reality. Taiwan's 1993 Six-Year Development Plan ... called for the inauguration of sixteen plants by 1996. However this plan has been plagued by major delays. As of this year, not sixteen, but rather only five have been installed.' (*EBB* 360: 6)

This is part of a general adoption of incineration by Asian governments who are looking to this technology to provide the answer to their solid waste problems, given the difficulties they face in finding sites for landfill. One Taipei environmental consultant warned against over-reliance on this technology: 'The government here looks on incinerators as a magic bullet that can help them avoid dealing with nasty political battles over landfill siting.' (*FEER* 21/9/89: 82). Japan dominates this environmental sub-market. (*EBB* 302: 9)

Critics claim the failure of the EPA is exemplified by its enthusiastic endorsement of toxic technologies as technical solutions to environmental problems: 'The EPA is using approximately $220 m from profits of the state-run CPC to construct three waste-to-energy plants and five municipal solid waste incinerators ... By 1993, 2300 tonnes of municipal solid waste will be incinerated daily, rather than the current total of 191 tonnes. This programme will increase the percentage of solid waste disposed of by incineration from 1.4% to 12.7%.' (Feeley: 927)

There has also been some export of hazardous waste to Taiwan. Between 1990 and 1993, according to research by Greenpeace, Taiwan imported 1280 tonnes of ash and residues, 5470 tonnes of metal waste, 317 tonnes of plastic waste and 45000 tonnes of hazardous waste. (Greenpeace: 5)

There have also been attempts by Taiwanese companies to export waste, the most infamous example of which involved 3000 tonnes of mercury-tainted waste from FPG's mercury cell PVC plant at Jenna, Kaohsiung, that was found dumped on open ground 15 km outside Sihanoukville, Cambodia, on 4 December 1998. A worker who cleaned out the hold of the ship transporting the waste died within 24 hours. Villagers who scavenged the waste became ill and two died, setting off a panicked evacuation during which four people died in traffic accidents.

One died during a riot against corrupt officials who facilitated the import. The army was called out to deal with the waste, which was eventually brought back to Taiwan by FPG. FPG then began to scour the world for another disposal spot, trying to export the waste to the US, France and Germany, each time being stopped by a coalition of environmental and community groups and dock unions. In June angry residents of Jenwu blocked roads in opposition to FPG treating the waste in their area. FPG negotiated compensation of NT$15 m with the residents to allow the treatment, which was underway in February 2002. (*TT* 7/6/00; 21/2/02)

The mercury scandal drew attention to the continuing toxic waste crisis. A report issued in January 1999 said some 100,000 tonnes of mercury-tainted waste generated by the chemical industry in the past decade had completely disappeared. On April 4, 1999 400 villagers from Chih Shan Yen, Pingting, stormed the EPA office and forced it to test waste dumped near their village and admit that it was also mercury-waste, over 5000 tonnes of it. This was revealed to have been dumped by FPG contractors. (*TT* 4/12/99)

The extent of the toxic waste threat came home again on 14 July 2000 when 25 tonnes of solvents were dumped in the Kasping river, polluting the drinking water of three million residents of Kaohsiung. In August 22 people were indicted for their role in this pollution, 12 charged with attempted homicide. Prosecutors have called for life sentences for five of these. (*TT* 29/7/00; 16/8/00) In October EPA officials and police found over 100,000 barrels of waste in Wiyi, Taiching. (*TT* 24/10/00)

By the end of 2001, the EPA had identified 175 illegal waste dumps, 14 of which it designated as an immediate threat to the health of local residents. (*TT* 1/2/02) According to figures released by the EPA in February 2002, Taiwan generates 1.5 million tonnes of industrial waste each year; only 40% of this waste is properly treated while the EPA has been unable to trace 20% of the waste. (*TT* 24/3/02)

Meanwhile the EPA's attempts to set up final waste repositories on Taiwan Sugar land in Kujien, Tainan, and Tacheng, Chagdua, are running into strong local opposition. On 28 May 2002 the EPA said it would not build the repository in Kujien until it received support from local residents, whom it proposed to compensate at a rate of NT$4.5 m per hectare. The following day EPA said the project would go ahead regardless of local opposition, threatening, 'We will keep communicating with local residents until they accept the idea.'

The new wave of opposition: Anti-incineration

There is a history of opposition to all forms of waste dumping, whether legal or illegal, leading to 'garbage wars' in 1993, when such struggles were underway in some seven of a total of thirteen counties on the island. (Arrigo: 33) Similar opposition arose to the proposed RSEA toxic waste centre: 'The construction of the proposed facility is also being opposed, even though it would clean up the many thousands of tonnes of illegally-dumped waste in the community.' (*HazNews* Feb93: 19)

In response to the general waste crisis at the beginning of the 1990s, the EPA decided to adopt incineration as a technical fix. EPA began a major programme of incinerator construction, expecting thirty-six new incinerators (twenty-one public and fifteen private) to be built by 2003, with 90% of waste being burned. By March 2002 there were 19 incinerators operating.

On 3 August 2000 residents of Meinung, Kaohsiung began a camp-out in front of an incinerator they said was operating illegally, endangering local health and farm produce. This blocked the incinerator's operations until 16 August, when some 300 police dispersed the 100 protestors blockading the plant. In April 2001 four officials were charged with corruption for accepting at least NT$194 m from the incinerator company. (*TT* 3/7/00;17/8/00)

On 11 April 2001 seven protestors and seven police officers required hospital treatment after clashes at the construction site of a small incinerator at Talin, Chianji. Construction had been scheduled to begin in March 2000 but was delayed by local opposition. (*TT* 12/4/01) In July an incinerator planned for Chinghia, Hsinchu was cancelled due to strong local opposition. (*TT* 1/8/00)

In December 2001 residents of Hsiaokang, Kaoshuing protested against proposed medical incinerators, residents of Changhua opposed an incinerator planned for Changpei, and residents of Yunlin opposed an incinerator at Linnei, fearing pollution of nearby farms. Critics argued too much capacity was being built. (*TT* 31/12/01)

In response to continued opposition, in March 2002 the EPA cancelled proposed private incinerators at Ta-an, Taicheng, Lukang, Changhua, and Chiku in Tainan and another in northern Taoyuan, and reduced the planned capacity of three others. Activists continued to oppose the incineration programme, claiming unused capacity would be used to burn medical waste. (*TT* 22/3/02; 23/2/02)

Notes

(1) For the economic development of Taiwan see Amsden, A H (1985) 'The state and Taiwan's economic development' in Evans, P (ed) *Bringing the state back in*, CUP, pp. 78-106; Simon, D F (ed) (1992) *Taiwan*, M E Sharpe; Wade, R (1990) *Governing the market* Princeton UP. On high-tech development in Taiwan see *BsWk* 6/5/96: 22-26.

(2) For the role of women in the Taiwanese economy see Hsiung, P-C (1995) *Living rooms as factories*, Temple UP; Kung, L (1995) *Factory women in Taiwan*, Columbia UP; Ward, K (ed) *Women workers and global restructuring*, ILR Press, pp. 179-192 and Cheng, L (1992) 'Women, export-oriented growth and the state' in Applebaum, R P (ed) *State and development in the Pacific Rim*, Sage.

(3) On Taiwan's petrochemical industry see also *CEN* 13/4/70: 16-19; *C&I* 3/10/94: 771-775. One source which I did not locate, but which appears fascinating, is Tan, K-h (1971) *Investment in Taiwan: a look at the petrochemical industry and US involvement in its growth and development*, MS Thesis, MIT.

(4) For further information on water pollution see *Free China Rev* 41(10):6-18; 43(8):34-39; 44(7):6-43. More generally see *Journal of North East Asian Studies*, Spring 1993:35-57 and *Journal of Developing Areas* 9:177-202. For EIA, see *EIA Review* 9:67-73 and 16:115-133

5

South Korea

Strong state, strong *chaebol*

In 1995 *Business Week* welcomed Korea into the first rank of world capitalist states. With the eleventh largest economy in the world, 'Korea could become the first nation to truly establish itself as an advanced industrial power since the emergence of Japan.' (*BsWk* 31/7/95: 33) South Korean President Kim Young Sam predicted, 'By the beginning of the twenty-first century, our per capita income will have risen to $20,000, with a gross domestic product surpassing $1 trillion.' (*BsWk* 31/7/95: 35) One sign of this success is Korea's joining the WTO in 1990 and the OECD in 1996.[1]

Korean capital was then entering into a major restructuring programme, involving huge global investment plans. 'Korean companies recognise that to make the leap to the next level of competitiveness against US, Japanese and European multinationals, they must undergo an unprecedented restructuring. With less than 5% of their assets outside their home country, they plan to spend more than $20 billion by 2000 to set up overseas production bases and to acquire interests mostly in US and European companies.' (*BsWk* 13/3/95: 22)

The first industrialisation of Korea occurred during the 1920s and 1930s while Korea was a Japanese colony. 'Between 1925 and 1939 the share of mining and manufacturing in total output jumped from 19% to 45%. Heavy and chemical industries played a leading role in this development, though most were located in the North.' (Haggard: 89)

Industrialisation returned to Korea following the Korean War. 'The first wave of industrial development in Korea during the 1960s led to the construction of substantial capacity in relatively labour-intensive light industries, including textiles, wigs, rubber footwear and toys.' (Enos: 34)

The industrialisation project of the Korean state was a resounding success: 'Exports of commodities, in real terms, increased at an average rate of 23.2% annually during the decade of most rapid growth, 1970-1980.' (Enos: 30) Between 1965 and 1980 manufacturing in Korea grew at an annual rate of 18.7%, while from 1980 to 1987 the rate was 10.6%, with the result that 'the industrial structure in Korea, which looked like that of low-income countries like India and Kenya in the 1960s, had become like that of upper-middle income countries like Argentina, Brazil and Spain by the mid-1980s.' (Chang: 131). One example of this growth may be cited: 'Korea is now the second largest shipbuilding nation in the world (next to Japan) and produced more ships (in gross tonnes) than Western Europe as a whole, whose world production share was 12.2% in 1986.' (Chang: 137) Thus, within thirty years, Korea transformed itself from an agriculturally based to a high-tech based economy. This development was accompanied from 1965 to 1990 by highly egalitarian income distribution, though it became less egalitarian from the 1980s.

Of course, the basis for this later success was provided by earlier accumulation, particularly in the labour-intensive textiles industry. The textiles industry has a long history in Korea, originally as ISI, changing to EOI in the 1970s. In the 1960s an artificial fibres industry was set up producing originally for the home market and exporting in the 1970s. Textile exports peaked at 45% of all manufactured exports in 1972 and dropped back to 26% in 1985.

Much of this success was based on super-exploitation of women's labour, in particular that of rural migrant females, who received rock-bottom wages and worked long working days. These women workers were concentrated in three industries – clothing, textiles and electronics, which were the leading export industries. In 1988 the *New York Times* described their working conditions as follows: 'Many begin their jobs with no understanding of what the conditions and pay will be; they are not told or they do not have the higher education required to read the Chinese characters used in contracts. Many are undernourished because they have time for just one meal a day. They often develop eye and skin diseases or

other ailments, and small factory owners may violate laws requiring them to pay for accident and illness insurance. Managers may cancel promised holidays or require overtime without notice; failure to show up means dismissal. Indeed, many workers are paid so little that they need to work overtime just to meet expenses.' (*NYT* 6/4/88: A4) To this day their working conditions are harsh, and numerous observers of South Korea's workplace practices note that 'managerial tactics frequently include verbal abuse, sexual harassment, and physical assault.' (Seguino: 20)

Women's involvement has increased over the period of industrialisation, rising from 28% of all manufacturing jobs in 1960 to 43% by 1990.[2]

Korea's industrialisation was strongly supported and controlled by the Korean state, though US pressure for Korea to become more economically viable and less dependent on US aid accelerated the shift to EOI in 1963. The emphasis on creating industries that could compete in export markets saved Korea from the fate of many developing countries which were saddled with industrial sectors that required endless subsidies and protection. Government organisations such as the Industrial Site Development Corporation and the Water Resources Development Corporation constructed industrial complexes, including the Yeochon Chemical Industry Base, with the government supplying infrastructure, including harbour facilities, roads, water supplies, etc. (Enos: 36)

The Economic Planning Board (EPB) was the central economic planning agency for the state, producing its first five-year plan for 1962-1966, and producing another six such plans until it was disbanded in 1994. 'The EPB was created in July 1961, immediately after the military coup led by President Park Cheng Hee ... to signify the seriousness of the regime's planning efforts, the military government elevated the head of the EPB to a rank of the Deputy Prime Minister (DPM) in December 1963.' (Rhee: 85-86) The same year Park also nationalised the banks: this control over finance was crucial to the state's disciplining of local capital.

Industrialisation was accompanied by the growth of massive conglomerates, named *chaebol*. 'The combined sales of the four biggest *chaebol* – Hyundai, Samsung, LG Electronics and Daewoo – equals a stunning 84% of the nation's economic output.' (*BsWk* 9/9/96: 23)

The importance of Japan's role in Korean industrialisation may be seen in Japanese dominance of FDI in Korea.[3] FDI in Korea from 1962 to

June 1987 totalled $4,056,100,000, of which 28.6% came from the US and 51.6% came from Japan. (Steven: 151) Japanese capital was also essential in providing a market for Korean manufacturing firms. The Japanese rush into South Korea to escape rising wages at home began in the early 1970s, with 290 projects approved in 1973, more projects than had occurred in all the previous years combined. (Steven: 148) As to sectoral FDI, 'Japanese firms account for the overwhelming majority of FDI in textiles, the third most favoured manufacturing sector ($214 million in 1962-1987). In chemicals, the second most preferred manufacturing sector ($504 million), US investments were much larger than Japanese ones.' (Steven: 151)

However the importance of foreign capital, especially FDI, in the industrialisation of Korea, must be put in context. 'The attitude of Korean capital to FDI from the US and Japan has always been to prefer loans to FDI, and to acquire technology under license rather than through direct investment. FDI has never, in the last twenty years, exceeded 5% of all foreign loans.' (Steven: 149) This percentage should be seen in the international context: 'During the 1970s FDI in Korea typically amounted to less than 5% of gross foreign capital inflows, compared to 85% in Singapore, 50% in Hong Kong, 25% in Brazil and between 12% and 18% in Mexico, Argentina, the Philippines and Indonesia.' (Rhee: 89)

Foreign capital was treated with suspicion in Korea, yet foreign technology was essential. Here again Japan's dominance can be seen: 'Japan has been the leading supplier of foreign technology, Japanese firms being the signatories on 55% of the total number of contracts approved by the Korean government. The US is the second most important supplier.' (Enos: 40)

Growth of the petrochemical sector

The growth of the petrochemical sector is an excellent illustration of the Korean industrial development story. Here the centrality of state control over local and multinational capital can be seen in the birth and early development of the industry, while the state's abandonment of control over the industry in the 1990s was to lead to crisis, due to the massive capacity additions built by the *chaebol* with foreign loans.

The 1960s saw the establishment of Korea's first modern chemical plants, a fertiliser factory set up with help from USAID, followed in 1967 with the establishment of Korea's first refinery. A D Little was then commissioned by USAID to undertake a preliminary study on developing a

petrochemical industry in Korea. Significantly, the Korean government's programme for the industry, included in the Second Five Year Plan of 1967-1971, was more ambitious than that proposed by A D Little. (Enos: 112-113)

Korea began to establish petrochemical complexes at Yeochon, Ulsan and Desan. (Todd: 39) Construction at Ulsan began in 1968 and by 1972 six plants and a naphtha cracker were completed. (Kim: 305) Ten firms built downstream plants, mainly between 1972 and 1974, but the cracker was half world-scale size and that hampered expansion. (Auty: 27) By 1992 the Ulsan complex hosted eighteen plants on a 711-acre site. (Kim: 305) Investment intensified in the early 1970s, with over half of total industrial investment going into chemicals, petroleum and basic metals. In 1977 a second petrochemical complex was decided on for Yeochon which involved a 350,000 ton naphtha cracker and 16 downstream units. Some 60% of the funding for Yochun was provided by foreign capital, (Auty: 26) coming from both private and state sources in Japan. (Kenji: 69) The 1977-1981 development plan also placed a heavy emphasis on these industries. 'In 1980, two-thirds of government industrial loans were dedicated to heavy and chemical industries (HCI).' (Deyo: 26)

Ethylene production was begun by the state-owned Korean Oil Corporation (KOCO) while downstream investments involved joint ventures between Korean corporations (particularly the state-owned Korean General Chemical Corporation [KGCC] and the Lucky Group) and foreign companies (particularly Dow Chemicals, Aramco and Mitsui). Thereafter, a process of privatisation and Koreanisation developed. In the first case, the naphtha cracker at Yochun, which was built by the KGCC, was handed over to Korean private capital, while in the second case a good example is Dow's sale of its Korean assets (including LDPE, chlorines and caustic soda plants) to a group of Korean companies headed by the Korea Explosive Group. (Oman: 103-104)

To facilitate development, the government in 1970 issued a Law for the Promotion of the Petrochemical Industry which gave five years' tax-free holiday to the industry, an incentive added to by a guaranteed return on invested capital. This drive into HCI was a strategic move by the bureaucratic authoritarian regime of Park. 'Shortly after the proclamation of the Yushin Constitution, President Park announced the "Heavy and Chemical Industry Declaration" of 1973, reasoning that the export-oriented HCI would improve national security and economic develop-

ment to realise the Yushin reforms.' (Rhee: 60) Thus the HCI drive was propelled not only by economic motives, but also by political/military motives. 'Park's strong commitment to the HCIs was based on the political logic that military/industrial complexes should be constructed to promote military capacities for self-defence and that, for this purpose, the HCI development was necessary for building military defence industries.' (Rhee: 60)

Given that domestic capital was wary of investing in HCI – the companies already being overly leveraged such that further unprofitable investment or long-term investment involved major risk – both inducements and penalties were required to force Korean capital to undertake its patriotic duty. Inducements involved preferential loans and access to FDI, tax exemptions and tariff protection, as well as guaranteed profit.

For those who refused the carrot, there was always the stick. Companies who failed to heed the call from the state found themselves in financial difficulties as the state suspended or sharply reduced their access to capital. (Rhee: 71)

It was at least partially through this HCI big push that the *chaebol* obtained their dominant position in the Korean economy. 'Licensed or even designated investments made by businessmen mono-oligopolise large HCI sectors ... Except for the steel industry, where the government had ownership and management control, a small group of the largest business firms were given licenses in such strategically selected HCIs as non-ferrous metals, petrochemicals, machinery, shipbuilding and electronics.' (Rhee: 81)

The government also changed its policy to induce FDI in the HCI: 'The government explicitly shifted its policy of FDI by reducing government support for export-oriented light industries (which were located in the Masan Free Trade Zone [FTZ]) and by increasing special financial assistance for HCI joint ventures (which were constructed in the HCI complexes).' (Rhee: 77)

If foreign capital was not crucial, foreign technology was essential. Of a total of 3073 technology contracts approved by the Korean government from 1962 to 1984, 502 were in oil refining and chemicals (16.34%). (Enos: 39,41) Japan's dominance in technology supply can be seen from Japanese involvement in 297 of these contracts. The only other significant technology supplier, the US, trailed behind Japan with 122 contracts. (Enos: 61)

Thus, in the petrochemical sector foreign technology was vital (Enos; Steven: 165) Despite foreign capital's involvement, the guiding hand of the Korean state was everywhere dominant: 'Having chosen the size, location and products for its petrochemical industry, the Korean government next decided who was to undertake manufacture and what technology they were to employ.' (Enos: 61)

Some indication of exactly how important FDI was in the development of the Korean petrochemical industry can be discerned from the following table:

It is clear that FDI was crucial only in the first period (1962-1966) for petrochemicals, where it accounted for 70.5% of investment in the sector, reducing to 0% in 1980 and 1982. Thus Korea used FDI for the first major push into the industry but quickly moved into self-reliance except for technology acquisition. For the period 1962 to 1994 chemical FDI in Korea was $1.9 billion, 43% of which came from the US, 23% from Japan, 10% from the Netherlands, 8% from Germany, 7% from England and 8% from elsewhere. (*CEN* 30/9/96: 17)

The industry's current status

The industry is now a major one. Production of industrial chemicals in Korea increased from 1976 to 1985 at an average annual rate of 8.9%;

Table 4: FDI shares of investment in industrial sectors 1962-82

	1962-66	*1967-71*	*1972-76*	*1978*	*1980*	*1982*	*Total*
Chems	21.5	13.0	9.9	29.5	50.0	31.6	20.5
Fertilisers/ petrochemicals	70.5	19.4	7.7	8.5	0.0	0.0	8.2

(Haggard: *90*)

the equivalent growth rate for other chemical production was 13.3%. (Bello: 100) Between 1970 and 1987 the ratio of HCI output to total output increased from 35.9% to 57.9%. (Kim: 297) Consumption of chemicals during most of the 1980s rose at an annual growth rate of 14%. (*FEER* 30/11/89: 80).

The industry is one of global scope and ambition: in the early 1990s the Korean petrochemical industry installed as much petrochemical ca-

pacity as western Europe installed in the thirty years after the first cracker was built in 1942.

In 1992 Korea already had a larger capacity for polyester fibres than all western Europe, producing some 1.2 million tpa. (*Ch Wk* 12/2/92: 20) In 1995 Korea's polyester industry was the world's fourth largest, accounting for some 11% of world production. (*FEER* 3/8/95: 50) Furthermore, 'The country is a world leader in terms of production and manufacturing of chemical fibres, weaving, dyeing and finishing.' (Kim: 297-298) In the intermediate chemicals sector, according to Takao Ayabe of Mitsui Toatsu Chemicals, 'Korean, and to a lesser extent, Taiwanese producers are emerging as major forces on the world scene, particularly in market segments such as antibiotic precursors and dyestuffs intermediates.' (*CMR* 7/2/94: SR21) One Korean company, Yukong, ranks among the world's top 40 chemical companies by sales. The industry increased output more than eight times in seven years. By 1992 it had become a net exporter. (*Econ* 13/3/93: 30).

Some indication of the scope of this investment can be seen in the increase in ethylene capacity from 1.16 million tpa in 1990 to 2.46 million tpa by the end of 1991, with an additional one million tpa due in 1993.

This expansion was driven by the *chaebols*' philosophy of expansion. 'Scaling down is the great corporate sin. Samsung can expand at 30% a year; we would be unhappy with less,' Park Ung-soh, president of Samsung's petrochemical division, told the *Economist*. (*Econ* 16/11/91: Survey 8) Samsung had just invested $3 billion in a naphtha cracker. Four other Korean *chaebols* followed Samsung into petrochemicals. In 1989 Yukong and Daelim expanded their naphtha plants, while in 1991 Lucky Goldstar, Samsung, Hyundai and Korea Petrochemical Corporation opened ethylene units. Honam and Han Yang were to open ethylene units in 1992.

At the same time, the *chaebols* began to make plans to expand abroad. 'As the new wave of environmental consciousness sweeps through South Korea, the country's *chaebols* are moving offshore to take advantage of the cheaper environments of China and the Soviet Far East. It will be interesting to see whether the environmental cost South Korea had to bear in the 1960s and 1970s will now simply be passed on to the new kids on the block.' (Merson: 21)

Examples of planned development abound, and not only in peripheral countries. In March 1995 Samsung's president Sung Rai Choi said the company wished to invest in chemicals production in Europe as part of its globalisation strategy. Suggested areas were Ulissengen in the Netherlands and Teeside in England, where they talked about becoming as big as ICI. Samsung was also planning large investments in the PRC. (*APC* June 1994: 45; *ECN* 6/3/95: 6; 10/4/95: 24; *CMR* 15/5/95: 9)

These plans led to fears of a greater overcapacity crisis than that which shook the industry internationally in the early 1980s, leading to the mothballing or dismantling of some 25% of world capacity in petrochemicals. Indeed the government failed to grant approval to the Samsung and Hyundai projects, while accepting plans by Lucky, Korean Petrochemical and Honam Petrochemicals, on the reasoning that these companies were at least already in the industry, while Hyundai and Samsung were planning to start from scratch. (*FEER* 30/11/89: 82-83) But the state's deregulation of the industry in 1990 allowed the *chaebols* to rush in where angels feared to tread: 'This led almost immediately to the construction of six world-scale naphtha-based ethylene crackers.' (*CEN* 6/8/01: 17) In 1997 eight companies were operating naphtha crackers.

Despite this massive capacity, the AFC impacted less on the Korean industry than was expected. Such changes as occurred were in the speciality chemical sector, which is much less developed. The sector saw MNCs acquiring a series of small companies, including buying out joint ventures (for a list see *CEN* 6/8/01: 18), while in the petrochemical sector hardly a single large-scale downstream unit, let alone a cracker, changed hands or was taken out of service. A proposed merger between Samsung General Chemicals and Hyundai Petrochemicals bit the dust (as did eventually, Hyundai Petrochemical, the only victim of the crisis, which was taken over by the banks in December 2001.) Samsung also sold its PTA and water treatment businesses. (*CEN* 27/5/02)

The basic failing of the industry has been its reliance on imported technology and its lack of R&D. LG Chemical is the illuminating exception here. Having succeeded in licensing drugs it developed in-house to SmithKline Beecham, in 1997 it had aspirations to become one of the world top 50 pharmaceutical companies, doubling its R&D staff. Its two other strategies were to become one of the world's top five PVC producers and increase its investment in the PRC, where its production of ABS and PVC accounted for half its overseas business. (*AsiaWeek* 7/12/01)

Industrialisation = environmental crisis

A pollution-haven strategy was basic to Korea's development. 'Some environmentalists in Korea believe that one of the main motives of Japanese investment in Korea was to export pollution-intensive industries in the aftermath of the environmental catastrophes like Minamata Disease during the 1950s and 1960s. The so-called "Yasuki Scheme" presented at the Korea Japan Cooperation Committee in 1970 envisioned a division of the chemical industry between the two countries. At the time a Korean daily reported that the Korean cabinet discussed the idea of importing pollution-intensive industries.' (You: 177)

An indication of what this meant in practice can be seen in the Ulsan/Onsan industrial complex. By 1986 FDI – mainly for petrochemical plants in Onsan – had reached $170 million; 75% was from Japan and 13.7% from the US. Of the plants, twenty-seven out of thirty-one were highly polluting. (Merson: 21; see also You: 177).

The first effects of pollution from the complex were on traditional food industries. 'Discharge of industrial waste water in coastal areas of the city affected fishing activities and aquaculture ... This water pollution, combined with air pollution caused by heavy industry, seriously affected the productivity of rice farming in the delta of the Taewha River.' (Shin: 241)

Later Onsan disease appeared, a disease of the nervous system, which paralleled earlier experiences in Japan and became a focus for early environmental groups. However, government press controls made information on health hazards to the public scarce. 'In 1986, Korean Anti-Pollution Movement Association (KAPMA) activists initiated Korea's first large-scale public environmental public relations campaign to publicise the Onsan disease.' (Eder: 100) In 1988 the government was forced to evacuate 376,000 people living near the industrial complex. Some $3 million compensation has been paid by companies at the complex to farmers and fisherfolk. (Merson: 21; AMRC: 14)

Pollution-related health problems were not confined to Ulsan. 'People living in Onsan, developed as a sister city of Ulsan, have reported many instances of pollution-born skin disease since the 1970s. Similar problems were also found in locations such as the cities of Pusan, Chinhae, Masan and Kwangyang.' (Shin: 241)

In addition, there are major water pollution problems, with heavy metal content of tap water so high as to make water unsafe and the

country's two major rivers, the Han and Nakdong, approaching biological death, (*PanosScope*: Apr93: 3) while some water bodies in urban areas are so contaminated that they cannot be used even for industrial purposes. (You: 172) This pollution has had the usual effect on fisheries and aquatic life. Chinhae Bay on the Yellow Sea 'has been severely polluted ... harvests of shellfish and production of near-shore fisheries have been greatly reduced. The number of fish species has declined from 141 to only twenty-four in recent years.' (Eder: 9)

Contamination with heavy metals is not just a water pollution problem. 'Industrial complex areas like Kuro and Ulsan are severely contaminated with cadmium, copper, lead, mercury and other heavy metals. Those numerous industrial complexes are located near the coastal areas, coastal contamination has become a serious problem. In the coastal sea of Ulsan, for example, concentration of lead and mercury was found at three times the legal limit and concentration of copper 47 times the legal limit.' (You: 173)

Ameliorative measures by industry were often purely cosmetic. A government investigation found 19% of over 25,600 plants with wastewater treatment plants were either not using them or using them incorrectly. (Bello: 101)

The dismissive attitude of capital and state towards environmental costs can be seen in their spending on environmental protection. 'As a share of GNP the government expenditure on environment was only 0.16% in 1988 which is, while a sharp rise from 0.06% in 1982 and virtually zero in earlier years, still negligible compared to 0.5-1.5% in OECD countries. The investment in pollution abatement in the manufacturing sector represented only 0.8% of the total capital investment in 1988 in comparison to 5-10% in the OECD countries.' (You: 176)

Toxic waste

According to the Environmental Administration (EA), South Korea each year produces 733,000 tonnes of hazardous waste, a figure which is growing 22% annually. South Korea also generates 19.7 million tonnes of general industrial waste a year. Over 50% of industrial waste is disposed of at state-run facilities: the government intends eventually taking over all toxic waste disposal. Most waste disposal consists of land-filling. 75% of industrial waste is simply dumped, as is 95% of household waste. In 1988/1989 the South Korean government built three incinerators and

another two were scheduled to open in 1991. (*FEER* 21/9/89: 85) Landfills are not of high standard. 'Of Korea's 601 legal landfills, only four were equipped with sanitary facilities as recently as 1994.' (Eder: 10) The state has plans for spending Won 97 billion on dumping facilities, including a massive coastal site near Seoul due on-line in 1992. Building another twenty-four dumps, which are planned mainly for coastal sites, by the year 2000, is expected to cost 252 billion won. (*FEER* 18/10/90: 73) By the end of 2000, Korea had nineteen large-scale incinerators operating and fourteen under construction. The Korean incineration market was estimated at $2.2 billion.

While such plans struggle ahead, much toxic waste is simply dumped. In a survey in spring 1990 of 373 companies in Seoul, sixty-three were found to have illegally dumped industrial waste, including Hyundai, Dong-A, Pfizer and Samsung. (*FEER* 18/10/90: 72)

Waste disposal practice is no better than would be expected. 'Toxic waste disposal firms (of which there are almost fifty) have been severely criticised, and prosecuted, for the illegal dumping of solid industrial wastes at sea, on mountain sides or in regular landfills.' (*BsAs* 13/3/95: 6) The problem is traced by *Business Asia* to manufacturing subcontractors: 'The core of the problem is that the source of much toxic waste is cash-poor manufacturing subcontractors. They are reluctant to build pollution control systems since the level of fines and penalties is still too low to force them to reform. Instead they make discrete (sic) payments to disposal companies rather than pay more money to have their waste properly treated.' (*BsAs* 13/3/95: 6)

The government estimates there are 7000 sources of industrial waste in South Korea, mostly clustered around Seoul and Pusan. While the country has environmental laws as tough as the US and Japan, there is a major problem with enforcement. Du Pont Korea president John Blackwell said in 1989, '(South) Korean companies don't want to pay for waste control and pollution control. The alternative today is cheaper: to disobey the law.' (*FEER* 21/9/89: 84)

Industrial waste has also been imported into Korea. Between 1990 and 1993, according to research by Greenpeace, South Korea imported 23,330 tonnes of hazardous waste, 3,016,681 tonnes of metal waste and seventy-four tonnes of plastic waste. (Greenpeace: 5)

Popular response

Those who attempted to draw attention to the effects of industrialisation were stigmatised and marginalised as 'antisocial'. The government successfully quelled attempts by striking workers, protesting farmers and communities to protect themselves from destructive development projects. (You: 163) Repressive measures were used against the intelligentsia. When Professor Kwon Sook-Pyo of Yonsei University published a short scientific paper in 1975 detailing the level of industrial air pollution in the port city of Pusan, he was interrogated by the KCIA about his 'negative' research. 'Professor Kwon was not alone. Many others concerned about the environment found themselves in similar situations when they openly discussed their concerns about the declining quality of the Korean environment in the late 1970s and 1980s.' (Eder: 95).

The first opposition campaigns were by groups of farmers seeking compensation for pollution caused by the new industrial complexes. In 1971 farmers near Ulsan formed a pollution counter-measures committee, followed by farmers affected by the Namhae Chemical Industry Complex in 1978 and other groups in Seoul and Inchon. While these campaigns won limited compensation and relocation subsidies, they did not lead to formation of environmental groups or resolution of pollution problems, which continued. In the early 1970s small environmental groups did arise, mainly connected to churches and universities, but only in the 1980s did an environmental movement involving large well-organised groups receive recognition, when elite groups made common cause with local grassroots anti-pollution groups. (Lee: 243)

The situation changed with the transition from a military dictatorship to liberal democracy in 1987 and the voicing of concern over environmental pollution and diseases. 'While the Korean environmental movement is not yet on the scale and militancy of the environmental movement in Taiwan, it shares the same exciting beginnings in localized protests focussing on concrete issues.' (Bello: 111) A foreign observer notes that by 1995 there were over 300 private (i.e. non-state-sponsored) NGOs dealing with the environment. (Eder: 111) Indeed this observer claims, 'Korea is rapidly becoming paralysed by the NIMBY syndrome.' (Eder: 106)

In 1984 over 40 NGOs combined to create the Korean Environmental Forum. Another organisation, the Korean Federation of Envi-

ronmental Movements (KFEM), whose origins lie in the Anti-Pollution Movement Association, involves some 350 separate organisations. (Eder: 122-23) And there is Green Korea, known prior to 1995 as the Baedal Eco-Society, whose headquarters are in Taejon. This group came to prominence when its associated Green Warriors conducted and made public independent water quality tests during the 1991 Naktong River Crisis. (Eder: 122-23) In 1987 the first movement style NGO – the Anti-Pollution Movement Association (KAPMA), led by former dissident Choi Yul – came into being. Choi's organisation assisted individual communities in protesting against local pollution problems. (Eder: 102)

In the first seven months of 1990, there were 73 anti-pollution protests, with the National Police headquarters estimating that 24,000 people took part in demonstrations, mainly in the heavily industrialised south-eastern part of Korea. In June 1990 Oriental Chemical was unable to start production at its chemical factory in Kansan due to local opposition, which was manifest by a petition signed by almost 100,000 people. In July 1990 the government delayed construction of an industrial dump in Pusan port after 5000 people protested, building barricades, blocking roads and taking an Environment Ministry official hostage.

In March 1991 people took to the streets of Taegu after Doosan dumped phenol in the Naktong river, which supplied drinking water to around ten million people. (Merson: 20) 'Eight Doosan officials were arrested, the chairperson was forced to resign and the company was forced to pay $30 million compensation. The scandal also lead to the sacking of the Korean Environment Minister. (*FT* 26/4/91: 4) Doosan owned a waste water treatment plant, but the costs of running it were too high. This is a common view (and practice) in Korean industry and it has been reported that companies dump into rivers, as paying fines for pollution is cheaper than installing pollution control equipment. (*HazNews* 39: 18, June 1991)

The Teagu disturbances were followed within days by protests in Taejon against the pollution of the Kum River. In May 1991 residents of Kynggi-do province blocked transport of industrial waste to a plant whose pollution threatened local agriculture and residents' health. A bill was introduced allowing life imprisonment terms for those who break environmental laws. (Merson: 20) In May 1992, residents closed the solid waste dump at Kimpo for over a month after illegal dumping of toxic waste there was discovered, forcing many factories to curtail production. (You: 158) Opposition is also affecting industrial siting. In February 1995

Hankook Titanium Ltd Co announced it would shift its titanium dioxide plant from Inchon to Onsan for environmental reasons. (*CMR* 27/2/95: 24)

In public opinion polls conducted in 1986 and 1988, 50% of those interviewed felt Korea's environmental problems were very serious and were intensifying, (Kim: 229) while polls taken for the Environment Ministry found the percentage of the population that would not accept polluting industries in their communities increased from 31.4% in 1982 to 47.4% in 1990. (Shin: 245) As to the composition of the movement, the *Far Eastern Economic Review* reported, 'Most of the protestors are poor people who live near the factories and dumps which are on the outskirts of the capital or along the southeastern coast.' (*FEER* 18/10/90: 72)

The surge of popular opposition that arose in the early 1990s was accompanied by a widening growth of national environmental groups and a 'depoliticisation and ideological modernization of Korean environmentalism', (Lee: 247) exemplified for Lee by KAPMA coordinating its activities in the run up to Rio in 1992 with business groups, that paid KAPMA's expenses for participating in the conference. By 1996, now renamed KEFM, the organisation had 25,000 members and abandoned its old hostility to capital and state, along with its anti-pollution focus. By 2000 KFEM was the largest environmental organisation in Asia, with 70,000 members and forty-two branches. In many cases environmental organisations formed tripartite committees with bureaucrats and business people to oversee development projects' environmental effects, thus moving to a reformist position from a previously oppositional one.

However opposition on a local basis persisted, with strong campaigns mounted against the proposed Wicheon industrial complex near Taegu, golf and leisure developments and against nuclear power: 'These struggles often do not mirror the style of Korean mainstream environmentalism in the 1990s. On the contrary, the tactics of "direct action" are found here. It is not uncommon for local peasant groups to break into the offices of local governments and construction companies, block roads and become involved in violent confrontation with the police.' (Lee: 248)

More recently, opposition has focussed on waste disposal, with a growing anti-incineration movement. Incinerators have faced massive opposition campaigns due to their planned location near urban residential areas. The success of the opposition can be gauged from the fact that, instead of the planned sixteen incinerators, in June 2001 Seoul had only

two in operation, one in testing, one nearly completed and one proposed. Incineration projects were abandoned in Ansung, Anyang, Kwanju City, Pusan and Yoju Gun. Opposition groups came together to form the Network for Waste Free in 1996 and then the Korean Waste Minimisation Network in 1999, which ran a national anti-incineration campaign. Citizen concern over safety led to a doubling of construction costs.

The Korean environmental movement has recently taken on international work. In the words of Kyung Suk Soh, founder of the Citizens' Coalition for Economic Justice, 'We have begun investigating the wrongdoings of Korean companies investing in the Third World. Korean companies go to the Third World, establish factories and often cause labour problems and environmental degradation. Our organisation wants to raise these issues in Korea in order to put pressure on the companies.' (*MM* Sept95: 28)

Government response

Development of government regulation began in 1963 when a Public Nuisance Prevention Law was passed, and a pollution control office operated from then until 1977 with about 15-20 officials, when its status was elevated to a bureau, all this time operating within the Ministry of Health and Environmental Affairs. In 1977 the Environmental Preservation Law was passed, which introduced EIAs for major public works, and elevated pollution control to the status of the Office of the Environment. This finally became the Ministry of the Environment in January 1990 with its staff suitably increased to approximately 1200. Legislative and regulatory activity increased: 'Korea has adopted extensive pollution prevention legislation, especially in the areas of water pollution and toxic and hazardous materials.' (Kim: 301)

Enforcement of regulation has been weak. Shin notes that after 1977, though the environmental bureaucracy expanded, 'environmental policies were not strongly enforced because the agency often had to compete with other more powerful ministries, such as construction, or home affairs, or the economic planning board. These ministries took a dim view of environmental regulations.' (Shin: 247) Similarly, while new environmental legislation was enacted towards the end of the 1970s, 'no sufficient staff or financial resources had been allocated to departments and agencies responsible for exercising these legal authorities.' (Shin: 248)

The government has responded to the increased environmental opposition by undertaking major environment-related investment plans and

a raft of new legislation. Environment Ministry staff was increased by 55% to 1215 officials. A Won 17 trillion investment in pollution control measures between 1987 and 2001 was called for in a master plan to protect the environment. Most new developments now require an EIA and developers must obtain 'consensus' from affected residents before going ahead with projects. (*FEER* 18/10/90: 72-73)

There is a large amount of difference between legislation and the situation on the ground. According to Choe Yul, a spokesperson for the Korea Anti-Pollution League, 'The government does not enforce the laws.' (*FEER* 18/10/90: 73) Thus, to take the example of EIAs, Korea requires fifteen different types of projects to submit EIAs and consult the Environment Ministry before construction. Alas, the Ministry has no authority to take any further action after it has been consulted. As the *Far Eastern Economic Review* observed, 'The Environment Ministry, with its small and inexperienced staff and limited administrative jurisdiction, is very much a junior player in a government dominated by growth-first ministries.' (*FEER* 19/9/91: 43)

Government plans envisaged the proportion of GNP spent on environmental protection by both public and private sectors increasing from 0.23% (approx. $760 million) in 1993 to 0.6% in 1997 (approx. $3.4 billion). This was expected to be opposed by big business and to suffer from the usual failure of enforcement. Still, the pollution control industry has grown: the number of Korean engineering companies licensed to install pollution control facilities has increased from 160 in 1980 to 745 in 1993. Here again old patterns reappear: 'About half of the contracts awarded in 1993 were grabbed by just twenty-five of the largest and most influential pollution control companies, many of which are linked to large conglomerates like Samsung, Daewoo and Hyundai.' (*BsAs* 13/3/95: 6)

Environmental impact assessments

EIAs were introduced in 1981, first for government projects and later extended to private developments. The number of EIAs performed has increased substantially over the years. (Kim: 301) 'Approximately 3.5% of all projects for which EIAs have been prepared and reviewed are denied.' (Kim: 303) Recently the Ministry has cracked down on failures to comply with EIA conditions: fifty-three projects were ordered to cease construction, including twenty-two government projects and twenty-six private golf courses. (Kim: 303)

How effective public review and input will be remains in question. One problem relates to the EIAs themselves: 'The EIA documents are largely technical documents meant for experts rather than the general public. This is apparent not only from the material and the way it is presented in these documents, but also by the extensive use of Chinese characters rather than the Korean (hangul) writing system. In addition, there is extensive use of English language scientific terminology without Korean explanations.' (Kim: 304) A technical review of three EIAs, including an expansion to the Ulsan petrochemical complex, noted: 'Weaknesses included the lack of adequate maps and project descriptions, poor topological surveys and descriptions of affected areas, limited analysis of social impacts, and little consideration for public input and participation in the planning and review process.' (Kim: 311) The lack of care in such basic provision of information was mirrored in the attitudes to the local community: ' ... Absent are also detailed descriptions of existing communities as if the preparers are almost indifferent to the needs of the people currently living there.' (Kim: 312)

While the number of projects examined under EIAs by the Environment Ministry has grown from four in 1982 to 210 in 1991, the quality of EIAs is, if anything, declining. A survey of 277 EIA reports filed from 1982 to October 1989 found 65% were completed in less than six months and 96% were completed in less than a year, while experts consider a year of data collection is basic practice before work can begin on an EIA. Similarly, a Seoul University professor who sits on the Environment Ministry review committee told the *Far Eastern Economic Review* (29/10/92: 38) that 'over 90% of EIA reports obviously employ manufactured or borrowed data.'

Occupational safety and health

Korean industrialization has been accompanied by death and disease for the workforce. In 1980 a journalist reported, 'Five industrial fatalities and 390 injuries every day are five times the rate in Taiwan and Japan and 15 times the rate in the West. Given a 12-hour day in clangorous, ill-ventilated and badly-lit factories, serious accidents are inevitable.' (Elegant: 94) In 1985, 141,809 workers suffered injuries, 1718 were killed and 19,284 were partially or completely disabled. In the following year, injuries increased to 142,088 but deaths decreased to 1680. The attitude of capital and state was as would be expected. 'Ministry of Labour research showed, alarmingly if not surprisingly, that employers were very

reluctant to make any investment in occupational health and safety ... unionists claim that even the government had obstructed independent studies into occupational disease.' (*AMRC*: 13)

Korea has also seen outbreaks of the burning factory syndrome. 22 young women workers died in March 1988 in a fire at a small, illegal textile factory in Anyang. The women, who slept three to a windowless room, found their escape impeded by locked stairway exits which were also blocked by sweaters the women had knitted. Workers in the factory were young migrant women from rural areas. (*NYT* 6/4/88: A4)

The Wonjin Rayon struggle

The struggle at Wonjin Rayon provides an illuminating example of the state of occupational health and safety in Korea. It is also an excellent example of the vicious circle or product cycle which Cummings has referred to as underlying the NEA political economy. Thus the company was set up in 1959 with machinery imported from Japan, which it is now reported to be planning to relocate to the PRC.

From the beginning of Wonjin Rayon's operations, workers have suffered from exposure to carbon disulphide (C_2S), but they attributed the resulting numbness and paralysis to high blood pressure. In 1981 a worker in the spinning section had the dubious distinction of being the first person in South Korea to be diagnosed as suffering from carbon disulphide poisoning. The company concealed the diagnosis, failed to inform either the workers or government authorities, and failed to take appropriate steps to reduce exposure.

In 1987 four workers received government recognition as victims of carbon disulphide gas poisoning. In 1988 workers and their families set up the Committee of Wonjin Rayon Occupational Disease Sufferers and Families. Meanwhile, an investigation by an opposition political party found vapour concentrations in the workplace were 2.6 times higher than the TLV. Under pressure from local community and the press, Wonjin Rayon settled with the Committee, agreed to clean up and identified 45 workers as suffering from carbon disulphide poisoning.

Despite the improved working conditions, cases of poisoning continued to occur. A worker, Kim Bong-wan, whose recognition as a victim of occupational disease was rejected, died in January 1991. Workers at the factory struck work and public rallies were organised in March and April 1991, leading to an eventual compromise in which the company

agreed to pay Kim's family compensation. In 1992 another survey identified 32 more disease victims. (PPT: 6)

Bankrupt since 1979, WR is under the management of the government-owned Korea Development Bank. Profit is likely to be made from selling the factory land on the real estate market. In 1995 it was reported that this was precisely what was to happen. Plans were for the now-antique plant to be scrapped and reassembled at a new location in the Peoples Republic of China. Wonjin Rayon workers organised to oppose this continuation of the vicious cycle of which they had become themselves victims.

In 1994 Asian Labour Update reported that the factory machinery had been sold to a Chinese firm in Dandong in Liaoning Province in the PRC. Some 100 Chinese workers were reported to have been sneaked in on June 16th to dismantle the equipment for shipment to the PRC. In response the workers opposed the move, arguing, 'The Republic of Korea, a republic built on Confucian principles, has a moral obligation to protect its citizenry from danger, harm and neglect. Do we not have the same responsibility for our actions to other people in other countries?' (*WHIN* 43: 8)

Notes

(1) On the economic development of Korea see also *Technology Review* May/June 1979: 46-53; *NLR* 182: 3-31; *Geoforum* 21(1): 23-33; *Journal of Development Studies* 29(1): 24-48; Auty, R M (1994) *Economic development and industrial policy*, Mansell; Political Studies 43: 630-644; *Fortune* 18/4/94: 34-38; *BsWk* 31/7/95: 32-38. For a critical view see CIIR (1995) *South Korea: model and warning*. On the *chaebol* see Sterrs, R M (1989) *The Chaebol*, Harper and Row. On globalisation of the *chaebol*, see *FEER* 2/11/95: 46-52.

(2) On women in Korean industrialisation see Lee, H-C (1988) 'The changing profile of women workers in South Korea' in Heyzer, N (ed) *Daughters in industry*, Asia and Pacific Development Centre, pp. 329-355; Kim, Y-O (1996) 'Homeworking in South Korea' in R Pittin (ed) *Confronting state, capital and patriarchy*, Macmillan, pp. 307-329; Horton, S (ed) *Women and industrialisation in Asia*, Routledge, pp. 165-206 and Asian Exchange 11(1): 79-104.

(3) See also Castley, R (1996) *Korea's economic miracle*, Macmillan.

6

Hong Kong and Singapore
Contrasting city states

Hong Kong and Singapore have a certain similarity, inasmuch as both are ex-British colonies and essentially city-states. But as far as industrialisation is concerned, the contrasts rather than the similarities speak much about the patterns of the spread of toxic industry in Asia.

Hong Kong is, of course, the wet dream become flesh of the neoliberals. A British colony before it was handed back to the PRC, it has followed a policy and prospered from it. The colony has seen continuous high growth – since 1977 the GNP has tripled. Part of this growth relates to Hong Kong's position as an entrepot for trade with mainland China.

Regarding Hong Kong, Castells has noted, 'What has been fundamental is the flexibility of Hong Kong manufacturers to adapt quickly and effectively to the demand of the world market within the (textiles, garments, footwear, plastics and consumer electronics) industries.' (Castells: 47) This flexibility is due in part to the industry structure in Hong Kong, where some 90% of firms are small firms: 'The basic industrial structure of Hong Kong consisted of networks of small firms, networking and subcontracting among themselves on an ad hoc basis, following the orders channeled by small firms specialising in export/import.' (Castells: 48)

Hong Kong is unusual in East Asia in following a *laissez faire* policy on FDI: 'The Hong Kong government's attitude towards foreign investment is thus unique among the East Asian newly industrialising countries. There are no restrictions on entry, on the import of technology, licensing, or technology assistance agreements, or on the repatriation of profits. At the same time no distinctions have been drawn between local and foreign firms, no special credit or tax incentives afforded, nor even any particularly aggressive courting of foreign firms.' (Haggard: 109)

Foreign investment, excluding investment by overseas Chinese, began in the 1960s. In 1960 the first Japanese-Hong Kong joint venture in textiles was established and in 1963 the first synthetic fibre operation was begun by a British-Hong Kong Chinese joint venture. In 1963 the first US firms also entered Hong Kong to produce transistors.

Chemical development

Chemical imports into Hong Kong in 1992 were valued at $8.7 billion, with some $3.1 billion worth being retained in Hong Kong (including plastics, resins, dyeing and colouring chemicals, pharmaceutical ingredients), the rest (including polystyrene, polypropylene, PVC) being re-exported to southern China. Companies producing chemicals in Hong Kong include Cabot Corp., Dow Chemical Co., Enichem and Hoechst. In 1992 some $985 million worth of locally-produced chemicals was exported, mainly to Southern China, which has taken some 70% of Hong Kong's chemical production since the mid 1980s.

While the chemical industry is small, it has grown over the past decade. In the decade between 1982 and 1992 the number of chemical manufacturing plants rose from 690 to 736, with employment, now involving 7700 workers, increasing from 1% of manufacturing employment to 1.4%. Much of this growth is due to FDI. In 1991 FDI in thirty-nine joint ventures, involving thirty-five foreign companies, was $225 million. 45% of chemicals FDI came from the US, with Japan, France and England also figuring prominently.

In response to this increase, the Hong Kong government is developing industrial estates which are planned for partial use as chemical and plastics producing areas. One site currently being developed is Tuen Mun in the northwest. Reclamation work on this site was due to begin in 1994, to be completed in 1999. Factories expected to locate there include polyester, acetal, polystyrene and other plastic resins manufactur-

ers. Another site, at Junk Bay on the island's eastern side, which was due to open in late 1994, is also intended to accommodate chemical production. This is also a reclaimed land site. Both sites will be on the waterfront. One further site, on the west of Hong Kong, is being developed for bulk chemicals storage. (*CMR* 27/12/93: 8,22; *ECN* 21/6/93: 30; *APC* Sept93: 26-27)

Industrialisation = environmental crisis

The combination of small business enterprises and the *laissez-faire* capitalism of Hong Kong led inevitably to environmental depredation.[1] Here a description by a professional geographer is sufficiently clear: 'Water pollution reached serious levels by the 1970s and got worse during the 1980s. The increase in the incidence rate of cancer since 1963 may be one effect of the increasing pollution. As almost 90% of Hong Kong's liquid effluent load is discharged directly, a considerable amount of livestock manure, domestic waste and toxic industrial wastes are polluting water bodies. Coastal pollution has increased, especially in landlocked bays and Victoria Harbour. From the late 1970s, toxic heavy metals have increasingly been found in various kinds of seafood harvested from the nearby coasts.' (Edmonds: 181)

In 1994 an environment industry publication noted, 'About two million cubic metres of untreated industrial effluent and faeces are discharged into the harbour every day. High concentrations of cadmium, lead, nickel, mercury and copper (mostly from the printed circuit board industry) are regularly observed.' (*EBB* 309: 6)

Even where factories have waste-treatment plants, these are unsatisfactory: 'An EPD survey has found that 80% of Hong Kong's treatment plants are not up to standard, are not maintained properly and are more often than not operated by inexperienced staff.' (*FEER* 10/5/90: 24)

Toxic waste

Hong Kong opened its $165 million chemical waste treatment centre (CWTC) in July 1993. The CWTC, which has a capacity of 100,000 tpa, will be operated for 15 years by Enviropace Ltd, a joint venture 70% owned by Pacific Waste Management (a subsidiary of Waste Management International PLC based in Hong Kong), 20% by Citic Pacific and 10% by Kin Ching Besser. Facilities include incineration, biological and physical/chemical treatment and solidification. Most waste is expected

to be from the printed circuit board and electroplating sectors. Waste includes acids, alkalies and heavy metals. (*CMR* 26/7/93: 7)

Here again, the availability of this method of disposal of chemical wastes in no way guarantees that this method will be used. '90% of the producers of chemical waste are small commercial enterprises (with fewer than 50 employees) largely unable to pay for high-tech disposal. According to a poll conducted by Enviropace, they are not interested in the collection and orderly disposal of their wastes, even if it was free of charge, and would probably resort (as has been the case in the past) to the easier alternative of disposing of their wastes via the sewage system. If forced by more stringent monitoring to assume the responsibility for the waste they produce, such small firms might very well pull up stakes and move to China, where environmental regulations are less strict.' (*EBB* 309: 8)

Government regulation or *laissez-merdre*

The Hong Kong government first examined the possibility of environmental regulation in 1975 when it appointed an independent consulting firm, Environmental Resources Ltd., to review environmental problems facing the colony, leading to the appointment in July 1977 of an Environmental Protection Adviser. In 1986 this responsibility was moved to the Environmental Protection Department (EPD). From the beginning, however, the government was concerned not to overly inconvenience industry. 'It was made clear to the review team that proposals for action should neither interfere with industry or otherwise impair potential economic growth ... this meant no sudden introduction of rigid environmental standards. It was felt that in the short term such an approach would be unenforceable and politically unacceptable.' (Bidwell: 248)

Ten years later the government approach was unchanged. While one EPD officer noted some 75 to 90% of factories in Hong Kong were dumping waste illegally, the head of the EPD said, 'We are going to have to be very careful. We will have to act very reasonably and not seem to be asking too much of industry.' (*FEER* 12/11/87: 25)

Due to the inadequate enforcement of existing inadequate regulations, industry does what it likes. The EPD's enforcement section is understaffed and overburdened by the large number of polluters and potential violations.

Consequently, infractions against existing regulations are rarely prosecuted, and even then penalties are relatively mild. Thus, companies

doing business in Hong Kong find it cheaper to break the law than to invest in environmental protection equipment. (*EBB* 309: 6)

In mid 1989 Hong Kong announced a HK$20 billion ($2.56 billion) cleanup plan. How much of this has been implemented is another matter.

Hong Kong's plan to add a levy to chemical sales to cover costs of the proposed chemical waste treatment centre was met by objections from the Federation of Hong Kong Industries, who warned it would 'pose adverse effects on the local economy by encouraging relocation of many manufacturing industries away from Hong Kong.' (*FEER* 19/9/91: 40)

The local state has continuously backed down from plans to regulate environmental damage following industry protests. The *Far Eastern Economic Review* notes, 'Local factory owners, a tenacious lot, do not like being told the rules of the pollution game have changed after 40 years, and the government is usually willing to back down if the opposition is too strong.' (*FEER* 19/9/91: 40) Thus in the 1980s the Water Pollution Control Ordinance was delayed five years and in the early 1990s the government backed down from a major amendment it had proposed for the Ordinance. (*FEER* 19/9/91: 42)

Exporting hazards

As government increases the regulation of hazardous chemicals in Hong Kong, at least certain sections of Hong Kong industry are exporting their hazards, mainly to mainland China. Thus, while the Hong Kong government has begun to crack down on CFC use, the majority of the colony's 60-80 printed circuit board manufacturers (who use CFC-113 as a cleaning solvent) have shifted their operations to southern China, while styrofoam manufacturers (who use CFC-11) are moving into the Shenzen Special Economic Zone. (*FEER* 14/5/92: 54) In late 1990 it was reported that Pollux Bleaching and Dyeing Works is likely to move its highly polluting Sai Kung operations to Indonesia. Since April 1990 Pollux has been operating in Hong Kong on a licence that allows only non-polluting activities: in that period the company was caught illegally dumping dye waste on three occasions. (*Environesia* Sept/Dec 1990)

Singapore

Coming to Singapore, a sardonic British observer noted recently, 'Singapore is the world's second biggest port after Rotterdam, the third largest oil refinery and the producer of more than half the world's computer disk drives – not bad for a country of 2.8 million people who were living in tin huts twenty years ago.' (*Guard* 20/5/95: Supp22)

Singapore's economic miracle was built over the grave of working class organisations. At the end of World War II Singapore was the centre of the strongest and most advanced working class organisations in Malaya, and Malayan working class struggles were at their most militant, with the Pan-Malayan General Labour Union, founded in 1946 with strong Communist Party connections, uniting over 50% of the labour force and 85% of the trade unionised labour force.

'The British Military Administration dealt with this labour unrest in ways, many of which have since become normal practice in Singapore. In 1945, two Chinese newspapers were closed down, their staff and editors sentenced to prison terms for using the term "economic exploitation". Japanese POWs were widely used as strikebreakers (20,000 in Singapore alone) and "agitators" were excluded from future employment. Demonstrations were banned, troops were used against demonstrators, militants were banished, anti-communist trade unionists were sent out from Britain as advisers and an elaborate system of restrictive trade union legislation was used to destroy the militant organisation ... With the declaration of the state of emergency, a further array of repressive measures, arrests, purges of "undesirable elements" and even the hanging of PMFTU leaders finally sealed the fate of militant working-class organisation in Singapore.' (Steven: 133-134)

Female labour has been of the usual importance in the industrialisation of Singapore. As a result of this, Singapore has also needed to import female labour to maintain its economic development, a situation dramatised by the hanging of Filipino maid Flor Contemplacion in 1995. 'Flor Contemplacion was one of the 100,000 maids imported from the Philippines, Indonesia and Burma, to sustain a country where 60% of women work.' (*Guard* 20/5/95: Supp26)

Petrochemical development

Singapore has now become the third largest oil refining centre in the world, with a capacity slightly over one million barrels a day. In 1992

over $400 million was spent upgrading and refurbishing existing refining capacity in Singapore. Five foreign-owned refineries (PCS, Shell, Esso, *BP* and Mobil) have made Singapore Asia's premier refining centre. The petroleum sector accounts for over 10% of Singapore's total manufacturing output. (*FT* 29/3/93: SuppIV) Historically oil refining accounted for 26% of total manufacturing output and 26% of total exports in 1970, 36% of output and 40% of exports in 1975 and 35% of output and 41% of exports in 1979. (Haggard: 90) By 1994 the output of the chemical industry in Singapore was valued at $13 billion. (*ACN* 30/1/95: 25)

FDI was central to the development of the chemical sector, with foreign paid-up capital increasing from 19% in 1959 to 84% in 1973, and in the petroleum and petroleum products industry increasing from 0% in 1959 to 100% in 1973. (Haggard: 99)

Some 780 chemical companies have a presence in Singapore. (*ECN* 4/10/93: 18) In 1988 chemical output was valued at S$4.5 billion and refining at S$8 billion. By 1989 the chemical sector accounted for 20% of manufacturing output in Singapore and it was expected to rise to 33.33% if current trends continued, welcomed by Singapore's economic planners as an alternative to the volatility of the electronic industry, with 40% of manufacturing output. The current trends involved investment of S$629.5 million in chemicals, making up one third of all manufacturing investment in 1989; chemical investment in 1988 was S$536.2 m. (*FT* 9/8/90: Survey VI)

In 1978 the Singapore government launched a world-scale petrochemical complex with sizable Japanese financial and political backing. While Singapore had a well-developed plastic end-product industry, until then it had only one small PVC plant, with capacity of 18,000 tpa. Support by both Japanese government and capital came from Japan's desire for an assured source of petrochemicals: 'The major participation of Japanese companies reflected Japan's intention to secure a cheap and safe source of petrochemicals in Asia while it simultaneously sought access to Middle Eastern sources.' (Oman: 104)

The core of the complex was a cracker, with ethylene capacity of 300,000 tpa and propylene capacity of 160,000 tpa, owned by Petrochemical Singapore Corporation (PSC), a joint venture in which the Singapore government and a state-owned bank held 50% while the other 50% was held by a group of Japanese companies headed by Sumitomo. A downstream HDPE unit (capacity 80,000 tpa) is operated by Phillips

Petroleum Singapore Chemicals, a joint venture between Phillips Petroleum (US) (60%), the Singapore government (30%) and Sumitomo Chemical (10%). Further downstream units for LDPE (capacity 120,000 tpa) and polypropylene (capacity 100,000 tpa) are operated by the Polyolefin Company, a joint venture between Nihon Singapore Polyolefin, a group of Japanese companies which hold 70%, and the Singapore government with 30%. The final downstream units for ethylene oxide (80,000 tpa) and ethylene glycols (87,500 tpa) are operated by Ethylene Glycols, a joint venture between the Singapore government (50%), Japan Singapore EOG (30%) and Shell Eastern Petroleum (20%). (Oman)

There has also been downstream development in Singapore, with Du Pont, Mobil, GE Plastics and other companies investing over S$2 billion in a variety of projects. Something close to 300 multinational and local corporations are involved in refining, petrochemicals, industrial chemicals, pharmaceuticals and advanced materials in Singapore. (*FT* 29/3/93: SuppIV) Another planned project will involve the use of landfill to unite five islands off Singapore to create a S$4 billion petrochemical complex. (*FT* 18/2/93: 5) Later reports said this major infrastructure project will triple the amount of land devoted to chemical production, by connecting seven islands, four of which are already occupied by refineries and petrochemical units owned by the Petrochemical Corporation of Singapore. (*CMR* 7/6/93)

Petrochemical production in Singapore began in 1984. (*Econ* 14/3/92: 82) Some 90% of Singapore's chemicals output is exported. (*Econ* 13/3/93: 30) The value of chemical output increased from S$16.4 billion in 1990 to S$18 billion ($11 billion) in 1991. With its petroleum sector maturing, new development is expected to focus on petrochemicals, pharmaceuticals and speciality chemicals. (*Chem Wk* 12/2/92: 28)

Among other projects in the pipeline, Phillips Petroleum Singapore is considering a $2.1 billion investment through doubling its current LDPE capacity of 160,000 tpa. Mobil Chemical started up its $700 million complex on Jurong, producing 275,000 tpa para-xylene, 180,000 tpa benzene, 50,000 tpa ortho-xylene, and 75,000 tpa solvents in March 1994. (*CMR* 14/3/94: 4). Shell is planning units for styrene monomer, PO/PG and polyols on Pulau Seraya, while Du Pont's Lycra spandex unit in Tuas, which came on-line in the middle of 1992, is to double its capacity. Also on Tuas, Atochem started production in October 1993 at its $30 million, 50,000 tpa polystyrene plant. In 1993 a consortium involving Exxon,

Amoco and Capco announced plans for a major aromatics project. (*ECN* 4/10/93: 18) GE Plastics plans to invest $400 million from 1989 to 1998 in engineering plastics, beginning with a 100,000 tpa ABS unit, but the project is currently delayed. Du Pont spent S$120 million on a lycra plant due to open in 1992 and planned to add an adipic acid plant in 1994. (*Chem Wk* 12/2/92: 26; *CMR* 12/3/90: 7) GE is considering relocating its Pacific headquarters from Tokyo to Singapore, saying that a Singapore location is an ideal one for serving customers throughout Asia. (*CMR* 12/3/90: 7)

Upgrading strategies

Singapore has begun to develop strategies to upgrade its industry.[2] In the mid 1980s, as part of a government effort to establish Singapore as a regional pharmaceutical/health care production sector, the government formed the Institute for Molecular and Cell Biology at the University of Singapore to promote biotechnology. (Deyo 1989: 26)

In 1990 the government's Economic Development Board set up Singapore Bio-Innovations (SBI), whose aim is to encourage development of biotechnology in Singapore by encouraging joint ventures, alliances and collaborations between multinationals and local entities and by encouraging foreign biotechnology companies to set up in Singapore. By 1994 SBI had invested S$20 million in biotechnology companies, S$10.8 million of which was invested in ten biotechnology companies in 1993. (*ECN* 31/1/94: 24) These investments have not been confined to Singapore: in August 1993 SBI, in collaboration with three venture capital funds, paid some S$3 million ($1.85 million) to take a 25% stake in Kexing Biological Products, a biotechnology manufacturer of interferon in Shenzen in the PRC. This was seen as part of SBI's strategy of forming three-way collaborations between Singapore, the PRC and multinational partners. (*ECN* 2/8/93: 23)

Singapore is also diversifying into other sectors of the chemical industry. 'Singapore, given its trade and tax concessions, is fast becoming a centre for pharmaceutical companies, such as SmithKline Beecham and Glaxo,' according to Enrico Polastro of A D Little. (*CMR* 30/8/93: SR29) This has been described by some analysts as Singapore preparing for the second generation of chemical technology. They cite Glaxo's proposed $100 million drug manufacturing unit there. (*CMR* 23/9/91: 20)

The first pharmaceutical company to set up in Singapore was Beechams (now SmithKline Beecham) which opened a penicillin plant

in 1970. Expansions since then have added new products, with investment now totalling $90 million. (*ECN* 4/10/93: 18)

Glaxo's plant, set up in 1982 to manufacture the active ingredient for its anti-ulcer drug Zantac, is being expanded to manufacture active ingredients for three further drugs, with the new multipurpose plant expected to open early in 1994. Output of Zantac has increased twelve-fold since the plant opened.

In late October 1993, Fisons Pharmaceuticals opened its new S$100 million ($62.5 m) manufacturing plant in Jurong. This plant is Fisons' first venture outside England, Scotland and Wales, and is Fisons' largest capital investment ever. It will produce the active ingredient for Fisons' new anti-asthma drug, which will be exported to Europe for formulation into final product. With this opening three major English drug manufacturing companies, Fisons, Glaxo and SKB, now have major operations in Singapore. Japanese company Kaneka has also begun operations there.

The Singapore Economic Development Board is attempting to attract pharmaceutical companies to Singapore, not only to manufacture, but to undertake R&D. Its first success came in January 1993 when Glaxo opened a natural products research centre in co-operation with the EDB and the Institute of Molecular and Cell Biology. The EDB also hopes to attract US companies which find Puerto Rico less attractive as a tax haven due to the reforms proposed by the Clinton administration. (*ECN* 25/10/93: 27)

Singapore is also increasingly being used for regional technical development and customer service departments. Akzo Coatings' speciality coatings plant, which opened in 1991, includes technical labs for product development; Rohm and Haas has set up a resins and biocides technical centre and Arco Chemical has set up a urethanes technical centre. (*ECN* 4/10/93: 18) Atochem's product development centre is also in Singapore. (*ECN* 25/10/93: 12)

Toxic but clean

Singapore has also been reported by Greenpeace to be a transit point for waste for many Asian countries. Between 1990 and 1993, according to Greenpeace research, Singapore imported 1993 tonnes of hazardous waste, 469 tonnes of metal waste and 381 tonnes of plastic waste. (Greenpeace: 5)

A review of industrial health in Singapore in 1979 notes that 'the data for industrial accidents and deaths show a rising trend increasing from 854 in 1966 to 823 in 1968 and 1,525 in 1970,' (Kee: 273) this trend rising with the increased number of the workforce involved in industry. The same review noted an increased exposure to hazardous chemicals: 'There are numerous chemicals, many of them toxic, being used in chemical industries. The first detected victims of toxic substances were workers who we found to be exposed to them for forty or more hours in a workroom. Occasional occurrences of poisoning cases and episodes of industrial skin diseases arising from chemical substances are experienced each year in Singapore.' (Kee: 281)

Of course toxic chemical use is not confined only to the chemical and pharmaceutical sectors. 'About 3000 factories use chemicals in their manufacturing process. The scale of such factories ranges from small electroplating firms storing a few kilogrammes of chemicals to large industrial plants with bulk tanks storing thousands of metric tonnes of chemicals. The vibrant manufacturing sector creates the need for large amounts of hazardous chemicals to be imported and distributed in Singapore.' (Hock: 399)

Singapore has an unusual reputation in East Asia for its environmental restrictions being strictly enforced and complied with by manufacturing industry. Some multinationals in Singapore have made major capital investments in pollution control. Japanese company Ishihara Sangyo Kaisha is reported to have spent S$78 million of the S$390 million capital invested in its titanium dioxide factory on environmental controls, while Du Pont has spent S$24 million on environmental controls. (*FT* 9/8/90: Survey VI)

Notes

(1) See also *Environment* 32(8):17-20,39-45; *Environmentalist* 12(1):29-46 *BsAs* 153/93:4-5; *FEER* 12/11/87:24-28; 5/5/94:40-41

(2) See *Long Range Planning* 24(2):9-15

7

Thailand

Burning factories, burning opposition

In the late 1980s Thailand joined the NIC trend of accelerated development and received the dubious distinction of being described as a new dragon. 'Thailand has achieved average real growth in GDP of 6.7% a year over the 40 years since 1951, and double-digit growth for five years running, 1986-90 inclusive.' (Kulick: 108) There has been a substantial growth in exports, from $7.1 billion in 1985 to $60 billion in 1989, while manufactured exports tripled from $3.3 billion to $10.1 billion. (UNIDO: 1) UNIDO notes the similarities with North East Asia, but also stresses Thai distinctiveness: 'Although Thailand's rapid economic growth in recent years was similar to that of Asia's NIEs ... with a time lag, Thailand pursues its own path of industrialisation based on the country's distinct economic profile.' (UNIDO: 2)

During this period, Thailand showed the same alliance between industrial development and military rule as characterised the NICs, with the usual suppression of labour. The ICFTU reports, 'There are severe restrictions on the right to strike in the country. Employers are free to dismiss or lay off workers who are on strike and to hire new ones to replace them ... It is also legal for employers to dissolve, move, rename or temporarily close a factory and then selectively dismiss trade unionists.' (ICFTU: 16) This policy has been supported by the military. 'One of the

earliest moves of the National Peace Keeping Council after the 1991 coup was to suspend the right to strike in the public sector and to impose further restrictions on the trade unions.' (Kulick: 146)

With the saturation of its local market in the 1970s, Thailand turned to export-oriented industrialisation. 'The big push came with the Fourth Five Year Plan of 1977. This launched the Eastern Seaboard as the long-term site for large-scale heavy, medium and small industries. The target was to transform Thailand into an export-led manufacturing economy based partly on heavy industry and petrochemicals.' (Kulick: 141-142) With the discovery of natural gas in the Gulf of Thailand, the petrochemical industry received a strong boost. In the 1970s private company PTI spearheaded the plastics industry. With the vision of this success before it, and plentiful supplies of cheap gas, Thailand went ahead with its own petrochemical industry. Here again that old North East Asian characteristic, the developmental state, appears. Although free enterprise is the catchword, development has been heavily state governed because new entrants to industry have to secure government permission.

The Board of Investment (BoI), which was established originally in 1959, received new powers under the 1977 Investment Promotion Act which provides 'guarantees, tax exemptions, income tax relief and, if necessary, protection to companies undertaking activities which the Board of Investment designates as eligible for privileges.' (UNIDO: 21)

These incentives have led to major inflows of foreign capital. In the late 1980s, FDI increased substantially, especially from Japan. 'Thailand seems to be the preferred site for Japanese investors seeking to relocate their plants because of rising costs following the rapid appreciation of the Japanese yen since 1986.' (Tambunlertchai: 138) The OECD reports what amounts to an invasion by foreign companies in 1988 and 1989: 'During 1988 and 1989, foreign enterprises lodged 2,200 investment applications with the Thai Board of Investment; 720, or one per day, were Japanese and 610 were Taiwanese.' (*SCI Review* 9: 125)

In the 1980s, FDI went primarily to electrical appliances, chemicals, metal-based and non-metallic products and textiles (UNIDO: 167) as well as two non-industrial sectors: property and tourism. Japanese companies led, followed by Chinese (from Hong Kong, Taiwan and Singapore), Korean and American. 'These foreign investors are now responsible for half of Thailand's industrial output and employ one fifth of the industrial work force.' (Kulick: 115) UNIDO put the proportion of

FDI in Thailand in the chemical industry, from 1987 to 1990 at 9.8% from Japan, 18.3% from Taiwan, 4.4% from Singapore and 2.8% from Hong Kong. (UNIDO: 24-25)

This increased FDI is leading to a change in the ownership of manufacturing. 'During 1960-1987 Thai ownership (of firms with Board of Investment Promotion certificates) was 68.5% compared with 31.5% foreign ownership. By 1988 foreign investment surpassed domestic investment.' (UNIDO: 67)

Because of Thailand's heavy reliance on technology, expertise and finance, foreign capital controls Thai companies without major equity participation. Japanese companies, where 'the shareholdings of local business people are often dispersed among several individuals, while those of the Japanese investors are limited to only one or two companies' (Tambunlertchai: 136) exemplify this type of control.

However, Thailand's industrial structure remains a highly dualistic one and FDI has been a mixed blessing in economic terms. Although evidence is scanty, 'it tends to indicate that the contribution of FDI in terms of income and employment generation has not been significant. Their contribution to foreign exchange earnings and savings by foreign-invested companies also appear to be limited due to the high import content in their production.' (Tambunlertchai: 138) UNIDO also criticises the type of industrialisation that has resulted: 'The manufacturing sector in Thailand has undergone a process of continuous restructuring over the years without significant "industrial deepening".' (UNIDO)

By 1995 Thai industrialisation was beset by problems: 'Thailand is currently plagued with infrastructure bottlenecks, environmental degradation, occupational health hazards, widening disparities between urban and rural areas, and the inequitable distribution of wealth. Income distribution has not improved, despite achievements in the provision of social services. Pockets of poverty and inaccessibility to basic services remain. All this points to underlying problems capable of derailing the buoyant economy.' (Khoman: 289) The arrival of the People's Republic of China in particular, but also its neighbour Vietnam, as competitors for capital chasing low-wage labour, has placed an additional burden on the country.

These problems in the early 1990s were not dealt with by the Thai state, which 'seems to have been equipped with neither the institutional ability nor the desire to discipline business in the interests of deepening its

development project. Consequently, while it did take a leading role in the development, from the 1980s onwards, of petrochemical, steel and other industries associated with the 'Eastern Seaboard' programme on the Gulf of Thailand, in essence it was more *laissez faire* – by default as much as design – than its NEA counterparts. As a consequence it did not lever companies in the interests of technological upgrading, it did not in any significant way direct credit, it dismantled capital market controls, and fatally ... it failed to deflect investment away from unproductive activities.' (Henderson: 340-341) This failure on the part of the state led directly to the Thai initiation of the Asian Financial Crisis in early 1997.

Petrochemical development

Thailand followed the example of Korea and Taiwan in developing the petrochemical industry as a major part of its industrialization project. By 1975 plans were underway for a petrochemicals complex. (Pescod: 193) By 1980 the Thai chemicals and rubber sector, involving 104 companies, had sales of 73,085 million baht. 66.3% of the companies were owned by foreign capital. (Steven: 39)

Under the fifth development plan in 1981, the government made plans to develop a local petrochemical industry as ISI. Despite the massive ethylene capacity introduced in the early 1990s, it was only in 1999 that the country achieved self-sufficiency in ethylene and it was only in 2000 that the industry could export ethylene and PE. Development of the Map Ta Phut site plant began in 1987 with the first part of the complex starting operations in 1989. By 1997, the complex at Map Ta Phut covered 1265 hectares and contained over 50 chemical projects. By then the government had spent $110 billion developing the site and the local infrastructure.

Pailin Chuchottaworn of Bangkok Polyethylene described the development of Thailand's petrochemical industry as involving three waves of investment. The first was in 1982-1986, during which the first National Petrochemical Complex (NPC) cracker was set up by the government to substitute for imports. The second wave, from 1987 to 1994, was still controlled by the government, but was driven primarily by the private sector. By September 1989, NPC1 was producing ethylene, while the second NPC producing olefins and aromatics, was begun in early 1989 to deal with the expected increase in demand. During this period, The Olefins Company (TOC) and The Aromatics Company (TAC) were established. (TOC was established to operate Thailand's second NPC.

51% of TOC was held by downstream customers and 49% by the Petroleum Authority of Thailand.) The third wave began in 1995, with the government initiating market liberalisation. Prodded by this liberalisation, three projected crackers were planned by TPI, NPC and Siam Cement, valued at $2.45 billion. (*ACN* 29/5/95: 21)

The Thai state has maintained its control over this process: even with the April 1995 liberalisation 'Aromatics ... will remain in the control of the state-owned Petroleum Authority of Thailand until 2003. Restrictions on investment in the petrochemical industry by majority-owned foreign companies will remain.' (*FT* 22/4/95: 4)

The Thai government was assisted in its plans from the beginning by the International Finance Corporation (IFC), the private arm of the World Bank. According to the current director of the IFC's petrochemicals department, 'Fifteen years ago the IFC helped create the petrochemical sector there ... IFC assisted government and local entrepreneurs in structuring a gas cracker and downstream facilities and funded several resulting companies.' (*ECN* 19/6/95: 16) IFC has continued to support Thai petrochemicals development, funding other petrochemical projects by Tuntex, Vinythai and Solvay-Charoen Popkhand. (*ECN* 19/6/95: 16-17)

The petrochemicals industry was developed by the Thai government as a secondary ISI. Thus, in 1992 UNIDO opined, 'As long as downstream-industry exports continue to face bright prospects, and once petrochemical industry projects are in full operation in the 1990s, the growth of the chemical and chemical products industries is likely to be rapid.' (UNIDO: 36)

Thai Petrochemical Industry Co

The leading private local company is Thai Petrochemical Industry Co (TPI) which had $448 million in assets and $202 million in sales in 1989. TPI, the second largest company on the SET exchange, began producing LDPE in 1982 and HDPE in 1986. The company was based on a family textiles and agribusiness group. In March 1990, TPI spun off its LDPE operation into a new company, TPI Polene, which it then floated on the Securities Exchange of Thailand (SET). (*CMR* 10/2/92: 9) TPI also, at various stages, planned major production of petrochemicals outside Thailand with the Philippines, India and PRC mentioned at different times. Its first cracker finally went into production in 1997 making it

Thailand's first fully integrated petrochemical producer. In 1994 TPI claimed to have an annual turnover of $1 billion, with one-third of its production being exported. (*FT* 19/10/94: 33)

TPI followed an unusual corporate strategy in its search for technology and its approach to joint ventures: 'The group has mostly opted for much more expensive West German technology and support. The Japanese, Mungkorn (TPI vice-president) points out, either refuse to sell the newest technology or want to have control of the operation.' (*FEER* 23/8/90: 53)

Following the AFC, TPI provided a case study in the difficulties creditors had in making local capitalists toe the line. TPI's debts were estimated at $2.8 billion, $826 m of which was held by Bangkok Bank, the rest by IFC, Chase Manhattan and the US Exim Bank. Prachai Leopharratana, TPI's owner, estimated TPI would only need to sell a minority interest in the company to meet its debts. With Prachai constantly raising difficulties, creditors had TPI declared insolvent in March 2000 and booted out Prachai in April, replacing him with Australian restructuring experts Ferrier Hodgson, who were expected to implement a plan agreed fifteen months previously for creditors to take a 30% stake in TPI in lieu of unpaid interest. By the time of the creditors meeting to approve the restructuring in November 2000, the deal was for them to take 75% of TPI. The meeting was disrupted by the arrival of over 5000 TPI workers who surrounded the hotel in which it was to take place. The creditors attempted to reconvene at an office in the Ministry of Justice but, followed by some 2000 workers, it was rescheduled. When it took place on 27 November the hall was 'surrounded by 1300 police, several attack dogs and a SWAT team ... Three Navy gunboats were parked in a nearby canal for backup. Although 2000 TPI workers turned up to protest, they were overwhelmed, and the bankers peacefully approved the plan.' (*WSJE* 13/2/01: 10) Prachai continues to oppose the restructuring, which reduced his family's holdings from 60% to 15%, and has appealed the plan to the Supreme Court. (*FT* 20/4/00: 34; 14/11/00: 38; *WSJE* 13/2/01: 1,11; *BsWk* 12/2/01)

Despite the financing problems, TPI still holds a strong position, being the only integrated producer with a refinery, upstream, intermediate and downstream plants. As an analyst told *Business Week*, 'There were sound reasons behind what they did; it made a lot of sense. But they borrowed too much. That's the prime reason the whole thing failed. Had there been no crisis, this wouldn't have happened.'

The export of hazards to Thailand

There is no question that Thailand has become the target of hazard export practices. The *Economist* reported that one effect of the growth of environmental movements in Taiwan, South Korea and Hong Kong 'has been an effort by industry to shift its dirtier processes to countries that do not ask too many questions. The Thailand Development Research Institute (TDRI) recently looked at investment applications by foreign firms whose activities would produce significant amounts of hazardous waste. Between 1987 and 1989 such applications rose from 25% of the total to 55% of the total.' (*Econ* 16/11/91: Survey 21) Between 1972 and 1982 the number of registered chemical plants handling toxic materials doubled from some 300 to 600. (UNIDO: 77) By 1990 the share of hazardous waste generating units had increased to nearly 60%, compared to 25% in 1987 (Khoman: 291).

Previously the high level of Japanese investment in Thailand had led to accusations of hazard export by Japanese capital. In opposing this hazard export 'there were ... remarkable signs of sympathy and co-operation between the Thai and Japanese peoples ... On 14 September 1973 environmentalists in Japan organised a march against the Asahi Company's export of pollution to Thailand in the form of its caustic soda plant which discharged mercury into the environment. One year later, on 14 September 1974 the Japanese organised another march while the Thai environmentalists simultaneously organised an exhibition on pollution export at Thammasart University in Bangkok.' (Tuntawiroon: 162)

Government regulation

The Asahi caustic soda plant provides a useful example of contradictions inside the Thai state in response to pollution. Figures from the Ministry of Industry reported mercury discharge to be only 0.003 ppm, while the Ministry of Health reported the mercury discharge to be 2.718 ppm. The differences resulted from different methods of data collection: 'Whereas the Ministry of Health officials went to collect the samples by boat at night without warning, the Ministry of Industry's officials announced the exact time of their arrival well in advance and arrived punctually at the front gate of the factory.' (Tuntawiroon: 162)

A study of environmental issues in industrial siting in Thailand and India points out the role played by the Board of Investment (BOI), which was the first such institution to be set up in South East Asia in 1960, which is responsible for the allocation of substantial investment incen-

tives to multinationals, and the Industrial Estate Authority of Thailand (IEAT), which helps corporations obtain government licences, manages the industrial estates and sets and enforces environmental and safety standards. In an illustration of the unimportance of environmental issues in siting decisions in Thailand, White explains, 'The status of BOI contrasts sharply to the relatively limited authority of Thailand's National Environmental Board, an advisory and planning body whose ability to influence multinationals at the licencing stage occurs only indirectly through other members of the cabinet. Once a facility is licenced, the board's role is limited since the enforcement of environmental and occupational standards is largely assumed by IEAT, an entity whose first priority is economic development. The result is that once permitted to enter the country, the multinational itself is the dominant force in most, if not all, key business decisions: location, sophistication of technology, size and design of technology, safety systems and environmental management.' (White: 349) In the two Thai cases studied, involving Du Pont and Occidental, negotiations between government and corporations took 2-3 months, (White: 350) while from negotiation to construction and beginning of operational phase was a year or more. (White: 358) 'In all three cases the issues of environmental health and safety were not explicitly incorporated into negotiations between the host countries and the multinationals ... Environmental health and safety issues receive significantly less attention in the Thai process.' (White: 350-351)

This contradiction within the state between economic development and health and environmental protection was shown again when the Enhancement and Conservation of National Environmental Quality Act – much lobbied for by Thai environmentalists – was promulgated in February 1975. The Act set up the National Environment Board (NEB), one of whose experts was an employee of Thai Asahi. (Tuntawiroon: 162)

From the beginning, the NEB suffered from a lack of authority to implement environmental protection regulations. One observer noted, four years after the Board was set up, 'While it is authorized, for example, to compel the production of information about the environmental impact of any proposed activity, public or private, the board is not empowered to issue regulations establishing a routine requirement for the submission of such data.' (Shane: 19-20) It is no surprise, therefore, that the NEB was a disappointment for environmentalists.

The failure of such reformist state measures as the NEB is exemplified in the situation regarding EIAs. The legislation allows for no public

hearings or court procedures regarding EIAs: 'The EIA has thus become a mere cosmetic. It is the usual practice for the proponent agency to go out shopping for the cheapest and most obliging consultant (who are mushrooming everywhere) and hire them to produce a thick, colourful and usually meaningless report, ending with the message that in spite of some minor problems here and there, all will be well with the project should it be given the green light.' (Tuntawiroon: 163)

Public involvement is out of the question. The NEB restricts circulation of EIAs as far as possible: 'The very fact that EIA reports in Thailand are still written in the English language is a good indicator that they are not intended to be understood by the common people whose lives would be affected by the projects, but are produced solely for the benefit of the so-called foreign experts.' (Tuntawiroon: 163). In all, there has only been one public hearing for an EIA in Thailand. The opposition's position on EIAs was summed up in October 2001 by an opponent of the Thai/Malaysian gas pipeline: 'Not only this pipeline project's EIA, tell me one EIA report in this country which has been done transparently with complete information.' (*Nation* 26.10/01)

In 1992 Thailand absorbed the NEB into the Ministry of Science, Technology and Environment (MOSTE) as part of a package of new environmental laws. These laws involve increasing penalties for environmental crimes to include jail sentences and increasing maximum fines to Bt2 million ($79,000) as well as allowing the government to create emission standards for pollutants. (*FEER* 20/98/92: 46)

More recently, the Thai government responded to the growth of middle-class demands for a higher quality of life by tightening environmental regulations and allocating finance to water projects, such as the proposed investment of $800 million in sewage plants for Bangkok. Similar concern was exhibited by the government declaring Pattaya and Phuket – both tourism industry centres – pollution control and environmental protection zones.

However, these new regulations have their own problems. In the case of water pollution regulations, one business publication reports, 'A major problem is that the standards merely set a maximum pollution concentration level in effluent, with no restriction on the volume of water discharged. Hence, heavy polluters could simply dilute their effluent to bring it within acceptable limits.' (*BsAs* 28/3/94: 3) Other factors undermining the new legislation include giving responsibility for pollu-

tion control to provincial governors, with the likelihood that enforcement will vary by province, and giving the Pollution Control Department power to enforce regulations only when the Department of Industrial Works and IEAT, the line agencies responsible for pollution regulation, are not discharging their duties properly, leaving major scope for confusion and conflict. (*BsAs* 28/3/94: 3)

Enforcement of these laws presents a problem. The *Far Eastern Economic Review* reported 'Thailand's pollution inspection agencies are hopelessly understaffed, and owing to low salaries, vulnerable to bribery.' (20/8/92: 46) Some improvement has been seen but the situation is still highly unsatisfactory: 'Between January and November 1993, a total of fifty-seven factories were ordered to close temporarily to improve their pollution-control systems, up from thirty-nine in the same period in 1992. But these are small steps against a culture of general indifference within the Thai business community.' (*BsAs* 3/1/94: 3) Industry shows a similar attitude to these laws as we have become used to elsewhere: in Bangkok 'local people allege that factories only run their compulsory waste-water-treatment plants when inspections are due, because of the running costs.' (Ross: 280)

But while regulations exist, enforcement is lacking. The environmental pollution departments of the government have difficulties recruiting staff who receive salaries three times higher in the private sector. Many Thai officials also cite the danger of assassination by business gangsters as a reason why legislation is not implemented. (*FT* 31/3/93: 18)

Failure to enforce planning controls leads to increased hazards as well: 'The notorious inability to agree upon or enforce planning controls has led to the uncontrolled siting of factories in areas where great danger is presented to local ecosystems (particularly through the water systems) and nearby populations.' (Ross : 275)

Protection of the environment is also made more difficult by the multiplicity of agencies that share responsibility for environmental protection. The IFC notes, 'responsibility for enforcement is unclear and spread across a variety of governmental bodies with conflicting jurisdiction, resulting in a less effective policing of the environment. Prosecution of violators is not effectively pursued ... water resource management involves thirty central government agencies, under six Ministries and eight Bangkok-based state enterprises. Similarly, there are at least twenty-four agencies involved in land resource management.' (IFC: 53,54) When

problems arise, the state's response tends to be dilatory and tokenistic: 'The common practice adopted in response to these problems is to set up additional agencies or committees to draft additional regulations that are designed to be ineffective.' (So: 140)

Industry has also from the beginning resisted attempts to regulate its operations and the regulation of environmentally significant activities in Thailand has traditionally relied more heavily on negotiation than on strict, unflexible enforcement. (Shane: 21-22) Similarly, state response has been patchy: 'Action is occasionally taken against industrial air polluters on an ad hoc basis when air pollution reaches nuisance level and when the public complains. Again, however, no systematic regulatory scheme, and virtually no standards, have been established.' (Shane: 25-26)

The new laws are expected to create a growth in the Thai environmental market. A report by the IFC, the private arm of the World Bank, released in 1992, estimated, 'The total private sector market for pollution control equipment in Thailand ... at about $210 million per year. During the next decade, demand is expected to grow at a rate of 20 to 25%. By the year 2000, the private sector market for pollution control equipment and services in Thailand is expected to reach at least $1.5 billion.' (IFC: 3) Government expenditure on the environment was estimated to rise from Bt600 million to Bt6.7 billion in 1994. However, as these business commentators noted realistically, 'Given the government's track record on implementation, environmental plans and regulations should be treated with a healthy scepticism.' (*BsAs* 3/1/94: 3)

More recently, the AFC has been the excuse for inaction, with the state delaying the enforcement of new environmental management standards for factories for three to five years; 'Authorities did not want to impose too many costs on manufacturers,' an official said, but 'once the economy recovers, the Department would be prepared to enforce the new environmental protection measures.' (*BP* 24/3/99)

Industrialisation = environmental crisis

This development policy has led to environmental crisis. As one Thai observer reports, 'Escalating environmental problems such as air pollution from growing industrial and auto emissions, water pollution arising from household and industrial wastewater, solid and hazardous waste from industry and hospitals, coastal pollution, flooding and mudslides due to excessive deforestation, declining soil productivity and degradation of the watersheds that maintain soil-precipitation balances,

all present serious threats to the stability and sustainability of the Thai economy, and to the quality of life in Thai society as a whole.' (Phantumvanit: 302) No less reliable an informant than the *Financial Times* reports, 'Thailand in the 1990s is a vivid Asian example of how rapid industrialisation, uncontrolled urbanisation and unchecked tourism growth can hurt the environment to such an extent that the foundations of economic growth ... are threatened.' (*FT* 31/3/93: 18)

Thailand's industrialisation has had the usual consequences, one of the first being an attack on local food production. 'A survey by the Agricultural Toxicology Division in 1982-85 found that out of 606 rice and cereal specimens on the market, 90% contained organochlorines – chemicals that cannot be broken down or digested.' (Khoman: 295) Similarly, the agricultural sector has been affected by pollution from rural industries: one example was sickness and damage to crops and livestock in the north of Thailand due to what has been dubbed a 'mini-Chernobyl' – sulphur dioxide emissions from a lignite-fired power plant. (Khoman: 295)

The Gulf of Thailand is threatened by increasing pollution and reduced water flows from the Chao Phraya river. (Ross: 273) A recent survey of pollution in the Chao Phraya puts this pollution in a useful perspective: 'Like the Thames or the Rhine river, the Chao Phraya should be considered as a litmus test for the environmental protection efforts of the government. Chao Phraya River is severely polluted, in which deterioration of water quality has been observed along almost the entire stretch.' (Muttamara: 510-511) Needless to say, this technical review finds the government's efforts wanting: 'The poor enforcement by the government agencies concerned and their lack of commitment to the cause of solving Chao Phraya pollution problem has in past been responsible for the failure to control the pollution level.' (Muttamara: 515) The TDRI calculates that by the end of the 1990s there will be no oxygen at all left in the Chao Phraya river, and aquatic life will cease. The river will die, and it will cost $1.75 billion to bring it back to life. (Kulick: 121) In 2002 cleaning up the Chao Phraya was estimated by Pollution Control Department officials to require Bt10 billion, while the river was described as 'an open sewer for human industrial and agricultural waste for much of her 379 kms,' (*Nation*, 9/2/02) and experts reported the number of fish species in the river had declined from 294 in 1997 to 200 in 2002. (*Nation*, 14/2/02)

UNIDO cites a further example: 'Around eighty factories, including distilleries, dye and animal feed factories pollute the Tha Chin River,

which runs through an industrial and populated area in Nakhon Chaisni and Sampshran districts.' (UNIDO: 10-11) As for Bangkok itself, 'The majority of the more than 23,000 registered factories in Bangkok discharge their waste water into rivers and canals without adequate treatment.' (UNIDO: 78)

Toxic waste

The growth in toxic industry located in Thailand has led to growth in the generation of toxic waste. As Khoman notes, 'Industrial waste is dumped freely and often haphazardly into rivers and landfills or stored in drums on site with little or no treatment.' (Khoman: 292) Although all twenty-three (industrial) estates have wastewater treatment facilities, none operate facilities to treat hazardous waste. (Khoman: 295-297) In Thailand, 600,000 tonnes of hazardous waste are dumped into rivers and canals each year. (*EST* 27(12): 2271) The US-ASEAN Council for Business and Technology estimates hazardous waste production will increase by 75% from 1.99 million tonnes in 1991 to 3.46 million tonnes in 1996 and to 6 million tonnes by 2001.

In 1987 the government opened Thailand's first industrial and hazardous waste treatment centre at Bangkhuntien, near Bangkok, with a capacity of 100,000 tonnes. The physico-chemical treatment plant has been run for the state by SGS Far East, the local subsidiary of Swiss firm SGS, which also operates a landfill in Ratchaburi province for sludges and waste from the Bankhutien centre.

The unsatisfactory situation with regard to waste continues to the present day. A Waste Management Siam spokesperson said, 'Very few are willing to pay to handle their waste properly. It's really all a joke.' Following the AFC, many SMEs abandoned costly waste management schemes, helped by abundant and cheap illegal alternatives. 'Too often, local officials protect and profit from illegal dumps, usually in cahoots with influential criminal groups, claim industry watchers.' (*FEER* 5/7/01: 30-31)

The petrochemical industry has contributed to the problem. In August 1995 TPI announced it would take precautionary measures to ensure its waste is dealt with in an 'environmentally friendly' fashion, following reports that heavy concentrations of toxic waste were dumped in a TPI-owned area in May 1995. Local villagers in the area had complained of health effects from the waste, which was ABS-related. (*ACN* 28/8/95: 5)

Thailand has been a target for the international toxic waste trade. In June 1988 over 200 canisters of toxic waste were discovered outside a warehouse in the Klong Toey harbour area, where they had lain unclaimed for years. In October 1988 the Thai government ordered the shipping companies which had imported the wastes to return them to Singapore. Between 1990 and 1993, according to Greenpeace, Thailand imported 357 tonnes of ash and residues, 379 tonnes of metal waste, 90 tonnes of plastic waste and 1737 tones of hazardous waste. (Greenpeace: 5)

Occupational safety and health

The lack of concern for environmental effects is mirrored in working conditions which, as would be expected, are not far off those during the Industrial Revolution in Europe. There is again heavy reliance on migrant and child labour.

A 1988 study of Thai small textile producers for the Asian Productivity Organisation found factory conditions 'were universally less than fair. The working environments were dim, dusty, noisy and hot. The ergonomics of work station, neatness, work position and welfare facilities were ignored, neglected and abused ... The hiring practices of small mills, whereby they select unsophisticated and docile workers to then work in nearly intolerable conditions, the inadequate community support, lack of proper nutrition and little access to necessary medical care all put added pressures on relatively unprepared individuals.' (Quoted in Kulick: 146)

According to the Permanent Peoples Tribunal, 'ILO reports that the use of hazardous substances is growing along with its chemical industry, which accounts for over 2000 enterprises and employs 85,000 people. The rate of fatal accidents in the industry is also growing and is 70% higher than in other industries.' (PPT: 24)

An ICTFU report in 1995 charged, 'Accidents in factories increased at the rate of 20% to 30% per year while industry grew at only 12% to 15% per year. According to the Thai Government figures, there were some 37,000 occupational injuries and illnesses in 1987, increasing to 50,000 in 1988. For 1991, the inquiry reported 125,000 accidents. The 1992 figures exceeded 150,000. At this rate of increase, accidents have probably exceeded 200,000 by now. Adding in unreported accidents, an estimated 5,000 workers die in Thailand workplace accidents per year.' (ICFTU: 14-15)

The ICFTU further charged that increasing competition was undermining safety standards in the Thai toy industry, while John Osdnick, director of AFL-CIO affiliated Asian-American Free Labour Institute in Bangkok, told *Newsweek* (12/12/94: 23) 'If the workers ask for more wages or better safety standards, the factory owners will simply threaten to move to countries where wages are cheaper and the workers have no rights.'

In this area, again, government regulation is unsatisfactory: 'There are only fifty-six qualified safety inspectors to oversee more than 200,000 factories in the most heavily industrialised region of the country, the capital Bangkok and the central provinces to the north.' (*Newsweek* 12/12/94: 22)

According to research by Dr Malinee Wongpanich of the Occupational Health Department, Mahidol University, women workers have been temporarily driven insane or permanently crippled due to manganese poisoning at work in a dry cell battery factory. Textile workers suffer from byssinosis, fingers and arms are routinely lost in accidents involving unguarded machines. Wongpanich reports on working conditions in textiles: 'A 1981 study found more than half of these (company) dormitories housing eight or more employees per room, without drinking water or adequate toilet facilities. Sometimes there are three eight-hour shifts, so that three women working different shifts use the same mattress pad.' Wongpanich commented that these conditions were common in South East Asia and noted, 'Workers in western Europe and immigrants to the US suffered similarly when those areas were first undergoing industrialisation.' (Ives: 176)

High-tech hazards: Seagate

These effects on workers' health and safety are not confined to low-tech industries. Seagate Technology, a leading US manufacturer of disk drives, moved offshore to Singapore in 1982, then set up at Samut Prakan, just outside Bangkok. According to *Multinational Monitor*, 'Seagate has responded to an official Thai investigation into the deaths of workers at its disk drive factory outside Bangkok by denying responsibility for worker health concerns, firing workers who held a one-day strike and attacking the credibility of the government doctor assigned to investigating the case.' (*MM* Nov93: 6)

The controversy began in 1991 when hundreds of workers reported illnesses, attributed to exposure to lead at work. When five workers at

the company died, the Thai government was forced to investigate and assigned the investigation to Dr Orapun from the National Institute of Occupational and Environmental Medicine. Dr Orapun's investigations found up to 700 workers per shift at the company were ill, and while chronic lead exposure was found throughout the factory, she suspected some of the deaths and illnesses were caused by solvents. Seagate declared the suspected solvent to be 'completely benign'.

Workers in the company struck for one day in April 1991. 'Management responded by firing seven workers believed to be strike leaders. When worker protests continued, Seagate fired eighty more workers. Finally, Seagate fired over 750 workers, sending a clear message to those demanding improved working conditions and higher pay.' (*MM* Nov93: 6) The Thai government tried to restrain Dr Orapun unofficially and then officially. The director of the BoI told her directly to keep quiet about the Seagate case, saying her investigation was 'hurting the investment environment' in Thailand. The Thai press reported the government 'ordered the closure of the National Institute of Occupational and Environmental Medicine instead of speeding up the Seagate's investigation.' (*MM* Nov93: 7) Since then, three further Thai government agencies are reported as having visited the Seagate factory and given it a clean bill of health

By December 1994, eleven electronics factory workers and two babies had died at the Lamphun Industrial Estate, where both soil and water pollution is reported as attributable to 86 factories operating there. The deaths were suspected to be due to chronic lead poisoning. Deaths among workers at a Thai-owned company, Electro Ceramics Co, have been attributed to accumulated exposure to toxic chemicals. In its caring way the government has tried to cover up the problem by attributing the deaths to AIDS, without any medical basis for the claim. (*WHIN* 39: 6; 42: 14; 44: 15).

Burning factories

On 10 May 1993 Thailand suffered the worst ever factory fire in the world. A fire at the Kader toy factory in Phuttamonthon, Nakorn Pathon province, killed 188 of the 1800 workers in the factory. Of the workers who died, 174 were women. One factory worker said, 'My section chief told us not to go, not to move, when all the commotion started. When the fire got serious we all ran for our lives.' (*CEx* 12/5/93: 8) Another worker told *Newsweek* (12/12/94: 22) 'When I heard shouts about fire, I tried to leave the section but my supervisor ordered me back to work.'

Investigation of the factory's record by media and government investigators uncovered a familiar litany of failure by both the company and government regulators.

The factory owners were accused of routinely locking factory exits, despite previous fires at the factory. In 1988 a fire levelled the site, followed by another on 16 August 1989. (ICFTU: 14) The government inquiry 'concluded that improper building designs, inadequate fire exits and stairways, as well as poor health and safety practices at Kader, were the major contributing factors in victims not being able to escape in time. Survivors reported that locked doors and barred windows prevented many of the victims from escaping.' (ICFTU: 8) Also, 'Fire alarms in the first building were out of order and there were no sprinkler systems anywhere ... Flammable materials were kept on the walkways and the factory's ground floor ... The burning of raw materials in the fire gave off poisonous gas and many workers passed out due to lack of oxygen ... About 1,100 panic-stricken workers attempted to escape from a single stairway, clambering over the bodies of others which had piled up behind the exit door at the bottom of the stairway.' (ICFTU: 9)

The factory was operated by Kader Industries (Thailand), owned 20% by Taiwanese interests, 40% by Thai interests and 20% by Kader Industries, the largest contract toy manufacturer in Asia, operating in eight countries with its headquarters in Hong Kong. These interests squabbled among themselves as to responsibility but an international campaign, including a protest march through a toy store in Hong Kong, forced Kader Industries to agree in July 1993 to an increased compensation package. (ICFTU: 12)

If the company was negligent, so was the state. Therefore its reaction was not surprising. Riot police and soldiers were drafted in to control friends and relatives of workers who congregated at the factory. The state also rushed to provide a convenient scapegoat: it 'quickly laid charges against a worker after the police beat him to confess that he had smoked a cigarette just before the fire.' (ICFTU: 18) Following a year of pressure, Thailand moved the blame up the hierarchy by charging a factory engineer and three members of Kader's board. Over a year later it still had not charged Kader as a corporate entity with the fire. In this case also, state complicity was involved: 'The Thai government fire inquiry concluded that Kader had evaded safety laws "with the connivance of Government officials".' (ICFTU: 18)

As well as connivance, there was omission. While there are over 40 pieces of legislation or regulation on safety, occupational injuries, illnesses and diseases in Thailand, these regulations and laws are not enforced. According to a subcommittee of the government inquiry into Kader, 'There are not enough officials for inspection of business premises. The Welfare and Labour Protection Department has only thirty-six workers, the Industrial Works Department has only twenty workers but they have to do safety inspections of 200,000 business premises in the central and provincial regions.' (ICFTU: 20)

More generally, the fire raised questions over safety in factories in Thailand. An international labour expert said, 'There are a lot of Kader-like companies' in Thailand, chiefly Taiwanese-run plants.' 'Taiwanese and Hong Kong investors are notorious for their low factory standards,' a senior Thai government official adds, contrasting them with South Korean and Japanese-invested companies.

In response to the disaster, the Industry Minister ordered the inspection of factories in Bangkok by a special taskforce. '144 of the 244 factories inspected had ignored the law by not providing adequate fire escapes or fire alarms. This is 60% of all operations. Only factories with more than 100 workers and with buildings higher than three storeys had been inspected.' (ICFTU: 14)

Despite these investigations, no improvements had been made a year and a half later. 'Little has changed in practical terms since the Kader fire. We just seem to be waiting for the next deadly incident to happen,' Chulalongkorn University labour expert Lae Dilokuidhyarat told *Newsweek*. (12/12/94: 22)

Further accidents did happen. In November 1996, 17 people were killed by an oil storage explosion in Rayong. (*BP* 14/11/96: 13) In September 1999, 36 workers died and 97 local villagers were injured by an explosion which wiped out the Hong Thai Kaset Pattana factory in Ban Klang, Changmai. In October 2001, 15 died and 10 were seriously injured by a chemical explosion at the ST Thailand paint factory in Tambon Ban kao, Chonburi. (*Nation* 2/11/01)

Growth of opposition

The growth in pollution has created an inevitable reaction among those affected. 'Industrial development has ... provoked a reaction both from those concerned about their tourism livelihood and those whose

water sources are threatened by factory effluents or the effects of impounding water behind hydroelectric dams.' (Hirsch: 440) So and Lee report, 'In the 1970s and the 1980s, there was a fairly robust environmental movement from below organised by the NGOs to protect the livelihood and welfare of the local population.' (So: 122) As one example, in September 1988, 200 farmers and residents of Nakhon Pathom province marched to the local government offices in protest at water pollution caused by a dyeing factory, which affected water used for irrigation and for household use. The factory had been discharging waste for some years and contaminated water had flooded the local area, causing illnesses in residents and killing fruit trees. When no action was taken against the pollution, some 400 farmers held a protest at the factory, resulting in a confrontation. (Komin: 25)

The Thai environmental movement has shown a trend towards the use of direct action, particularly in the widespread anti-eucalyptus movement. This same appreciation of direct action is shown in the story of the successful campaign against the siting of a tantalum factory in Phuket.

A different kind of burning factory

On the 23 June 1986 residents of Phuket burned down a tantalum plant.[1] This attack was attributed variously to outside agitators, political conflicts and commercial rivalry.

At first the Thai government had strongly supported the project when it was proposed in 1981. The consortium involved, TTI (Thailand Tantalum Industry Corporation), was formed mainly by local Thai companies and investors. Some 20% of the capital invested was either Malaysian or from the World Bank's International Finance Corporation (IFC). Multinational capital was therefore only marginally involved.

Opponents of the plant were worried about the plant's use of toxic chemicals and the plant's effects on the tourism industry, the area's main employer. Opposition began with the construction work. By December 1985 TTI began to feel growing pressure from the protests and held a meeting to assure village heads and chiefs of the plant's safety. The opposition continued to grow, however. In April TTI claimed that the protest was politically motivated. The company responded to the growing protest by launching a newspaper advertising campaign promising that no pollutants or toxic substances would be discharged from the plant.

On 1 June 1986, some 50,000 people demonstrated in Phuket against the plant's proposed opening the following August. On 9 June the Municipality Council formally declared its opposition to the plant. In response to the protest the government claimed it had taken steps to ensure safety and no pollution. On 15 June, TTI announced the opening of the plant would be postponed by six months.

That the protest was a popular one cannot be denied. The people of Phuket hung effigies of major investors in the plant from lampposts during their campaign. By 22 June, some eighteen local groups supported the campaign. Protestors obtained and used information from residents of a German town where a similar tantalum plant was located.

The government undertook a fact-finding exercise, which they hoped to have completed by 2 July. The visit by a government minister on 26 June to meet local people was the cause of the massive demonstration that finally resulted in the plant's destruction. Frustrated at the failure of the Minister to leave his hotel for the hall where he was to address the people, the crowd attacked the hall, the hotel and three banks which were investors in TTI. Residents proceeded to attack and burn the tantalum factory from which a police guard had been withdrawn. 'The reason given was that the presence of police guards there might cause a misunderstanding among the people, who might think that the government was protecting the plant.' (*BP* 28/6/86) No one was injured in the riots, though police fired tear-gas. A state of emergency was declared. Some fifty people were arrested. When they had not been released the following weekend, there was talk of further demonstrations in Phuket.

The government's account emphasised that the riot was caused by outsiders. The explosion of the popular opposition to the plant into the fiery protest of 26 June was attributed to political manipulation and outside agitators. The Prime Minister was reported as saying the violence was not caused by Phuket people. The *Nation* (28/6/86: 8) reported: 'Several suspects have told police they had been paid to cause trouble during the riots. However the police have yet to produce the alleged master-minds.' Eight local protest leaders met army commanders to deny responsibility for the violence.

On 27 June, TTI announced it would abandon the Phuket factory as beyond repair. It said it would explore possibilities of an alternative site if it was guaranteed government support. This was not forthcoming, though the government had agreed to assist with compensation.

Whatever the origins of the violence, the popular rejection of the TTI tantalum factory in Phuket must be considered a major victory for the environmental movement in South East Asia. This struggle also shows how successful direct action by a united community can be.

Continuing opposition

By the 1990s some 200 environmental organisations existed in Thailand, fifteen to twenty of which are broad policy-based organisations, with the rest being groups focussed on local issues. (So: 127) These NGOs are not well-financed, and are often dependent on foreign funding, do not have professionally trained workers, are highly diversified and are under close supervision by the state through licensing, which involves not only a cumbersome registration procedure but also 'checking by the police, the cultural ministry and the tax authorities.' (So: 130) By the late 1980s the state began adopting an environmental discourse or rhetoric, while the 1990s saw the growth of big business environmental initiatives, including the creation of well-financed environmental organisations, including an Environmental and Development Network set up by Bangchak Petroleum and a Thai Business Council for Sustainable Development. This usurpation of environmental discourse by business interests is shown by how 'since 1995 Bangchak Petroleum became the major organiser of the Annual Environmental Conference, which in the early 1990s was organised solely by the NGOs.' (So: 132)

Despite this, local protests continued to be militantly opposed to waste projects, industrial estates and gas pipelines. Opposition in 1996 by villagers of Pluak Dang in Rayong forced the state to move the proposed GENCO toxic waste plant to Map Ta Phut. Villagers protested in April 1996 in Bangkok against a proposed landfill, which they said was too close to water sources. One villager said, 'It will face an even tougher protest and may end up like the tantalum factory in Phuket.' (*BP* 9/4/96) In 1997 residents of Khon Kaen province opposed proposed waste plants. (*BP* 12/6/97) On 16 June 1998 hundreds of residents of Nam Phrae village blocked the nearby national highway to oppose a planned landfill. (*BP* 17/6/98) In January 1994 opposition to incineration began and in 1999 was intensified when Greenpeace combined with local NGOs to highlight pollution from existing municipal solid waste incinerators in Phuket and Samin.

In 1998 villagers from Pluak Daneg again declared opposition to the proposed TS21 Industrial Estate to be built by a Thai/Singapore joint

venture, which they said would endanger water sources for Chonburi and Rayong and effect 300,000 local people's livelihood. A local councillor 'said the eastern seaboard province already had enough air and water pollution caused by the Map Ta Phut Industrial Estate and TPI Co.' (*BP* 7/2/99) Pollution problems from Map Ta Phut were reported continually from 1996 to 2001.[2] The Secretary General of the Office of Environmental Protection and Planning (OEPP) admitted that the first phase had 'caused serious environmental degradation – because most manufacturing plants declined to implement environmental mitigation plans stated in their EIAs.' (*BP* 26/4/97) This existing pollution motivated continuing protests. In November 1998 villagers took their protest to Bangkok. In April 1999 the Senate Committee on the Environment visited the site to examine the issues. (*BP* 13/11/98;24/4/99)

Similar protests have met proposed gas pipelines and power projects. In December 1997 activists from the Kanchanaburi Conservation Group began a blockade in the Hoey Pa Khok forest in Thung Pha Phun district to block the laying of a pipeline carrying gas from Burma's Yadama gas fields to a power plant at Ratchaburi. Opposition to the project began in late 1997 when the PTT announced plans to build the pipeline, some 50 km of which was to run through lush forest in Kanchanaburi. The activists abandoned the sit-in in early March 1998 after PTT agreed to alleviate the pipeline's social and environmental impact. (*BP* 27/12/97; 5/1/98; 17/1/98; 28/1/98; 11/3/98)

In 1999 another $1 billion pipeline joint venture between PTT and Petronas was approved, but ran into problems with protests by local villagers in Songkhla, which sometimes turned violent. The EIA for the project was rejected for the sixth time in August 2001. In September the EIA was approved by the OEPP but the experts reviewing it denied they had approved it. In January 2002 the Prime Minister visited the affected area with thousands of police, military and security agents to protect him as 'the protestors could be agitated and provoked into violence if the PM showed even the slightest hint that he will support the project in the designated area.' (*Nation* 6/1/02). In April the Prime Minister suggested the pipeline be rerouted, a suggestion the developers were unhappy with, as the change would require new studies and an EIA which would require two years to undertake. (*Nation* 28/8/01; 26/10/01; 27/10/01; 6/2/02; 12/4/02)

In April 2002 the Prime Minister also visited Bor Nok in Prachaup Khiri Khan, where 3000 protestors against a proposed power plant burnt

a copy of the EIA which they said was incomplete, while complaining of corruption and non-transparent decision-making, as well as the plant's environmental impact. The previous October protestors had attacked a survey team dispatched by the power plant company. Activists claimed their seven year campaign had faced a violent response, with rallies against the project violently dispersed and attempts made to gun down several leading opponents. The Prime Minister announced he would make a final decision by early April. The protestors' spokesperson said, 'We did our best to tell him everything. If he still decides to continue with the project, we have a final plan for him.' (*Nation* 16/10/01;25/1/02) Similarly, strong opposition arose to a proposed lignite plant in Tachilak, on the Burmese border close to Mae Sei district, with villagers preventing equipment from the PRC being shipped through their area from April 2001 and then contesting the construction site itself. In December the Burmese junta halted construction. (*Nation* 23/11/01; 20/12/01)

A critical voice in January 2002 claimed, 'The country is seeing more and more environmental militants, whose role has turned to bloody violence and destruction ... Their senseless rage, as witnessed during the previous riot in Had Yai ... seen with horror were not peaceful protestors, but a violent mob wielding sticks and steel bars.' (*Nation* 6/1/02) From this, and the short accounts of the recent campaigns above, it is clear that the Thai people will continue to militantly defend their environment. As an activist against the proposed PTT lignite mining in Waeng Hong noted, 'The benefit is to Egat and the private investors, who will gain by saving money. But the villagers are the ones who will suffer. How will the villagers live after the mining is completed in twenty years?' (*Nation* 25/11/01) Thus, 'as Thailand's environmental conditions worsen, the environmental struggles against deforestation, dam construction, community lands, fishing rights and air and water pollution will intensify.' (So)

Notes

(1) The Phuket story is based on Jones (1988). Thai Tantalum announced in 1992 it would locate in Map ta Phut (*FEER* 20/8/92: 53-54). In April 1996 control of the company left the country when Bayer announced one of its subsidiaries would take control of the company.

(2) See, for example, *BP* 26/4/97;5/7/97; 9/6/98; *Nation* 22/8/01

8

Malaysia
Rapid development, rapid crisis

KS and Edwards describe Malaysian industrialisation as beginning after independence in 1957 with a policy of import-substitution (ISI). By the mid 1960s the problems of this policy were becoming clear and in 1968 'a strategic switch in emphasis from import-substitution to export-oriented industrialisation (EOI)' occurred. (KS: 24) This involved the passing of the Investment Incentives Act of 1968 and the activation of the Federal Industrial Development Authority (FIDA) in 1967 to attract foreign industry. In 1969, following racial riots, the government declared a state of emergency, using it to amend the labour laws to make the way smooth for foreign capital 'by strengthening the Registrar of Trade Unions' powers to prevent electronic factory workers from forming a union, by allowing shift work for women, by restricting the right to strike, and by otherwise limiting trade union activities and rights.' (KS: 25) This was followed by the passage of the Free Trade Zones Act of 1971, with the first FTZ opening at Bayan Lepas in Penang in 1972.

This New Economic Policy (NEP) was accompanied by a sustained attack on wages: 'With the increase in low-wage EPZ employment, by 1978 the average real wage in the manufacturing sector was below that of 1968.' (KS: 27) This was accompanied by, and in some ways accomplished through, a feminisation of the labour force, with female participation in the workforce rising from 11% in 1957 to 29% in 1970 to 41% in 1980 and to 45% in 1985. (KS: 35)

Malaysia's NEP was unique in that its aim included the redistribution of wealth to native Malays. The NEP was accompanied by the usual array of Ministries, Industrial Development Authority, Economic Planning Unit (EPU) and state holding companies such as HICOM for heavy industries and Petronas for petrochemicals.

In the early 1980s the Malaysian state launched a third phase of industrialisation through a big push for heavy industries. 'The model for this attempted second stage of import-substituting industrialisation was South Korea, which had vigorously promoted heavy industries from 1972 to 1979.' (KS: 28)

In most cases this policy was a failure as the heavy industries chosen – including petrochemicals – already suffered badly from global overcapacity. (KS: 29 and Auty) With the obvious failure of this policy, the fourth phase began when changes in the mid 1980s again made Malaysia an attractive location for export-oriented manufacturers, leading to a surge in FDI into EOI projects. (KS: 34) More recently the state has attempted to foster high-tech development. Mahathir's dreams in this regard were summed up in the creation of the Multimedia Supercorridor, intended as Malaysia's answer to Silicon Valley, an array of science parks near Kuala Lumpur intended to incubate high-tech companies.

The average GDP growth rate in Malaysia was over 7% during 1970-1985. (Ali: 78) The economic growth rate in 1990 was 10%, while FDI was $6.4 billion, double that of 1989. (*CMR* 23/9/91: 20) Malaysia's achievement involved incomes rising an average of 6% annually for 20 years to an average income of $4000, while the incidence of absolute poverty dropped from 40% to a little over 5%. (*Fortune* 13/8/01)

Some of course had more success than others: post-tax profitability of foreign subsidiaries in Malaysia is high by international standards: in the boom years of 1974, 1978/1980, and 1983/1984, average profitability of foreign-majority owned firms exceeded 20%, occasionally 30%. (Ali: 98)

Up to 1986 Singapore was the largest source of foreign equity in Malaysian manufacturing with close to 30%, followed by Japan with 20%, Britain (16%), US (6%) and Hong Kong (6%). 'If we include foreign loans as part of the FDI measure, however, then Japan emerged as the largest source of FDI stock with 43%, followed by Britain (21%) and Singapore (14%).' (Ali: 84) US FDI reached close to $2 billion by 2002. (*Fortune* 10/5/02) In the early 1990s FDI averaged $5 billion a year, but currently it is down to less than $1 billion. (*Fortune* 13/8/01)

Jomo KS describes the current industrial structure of Malaysia as tripartite, 'with a resource-based export-oriented sector quite separate from import-substituting industries, which are in turn quite separate from the export-oriented clothing and electronics industries in the EPZs.' (KS: 36)

Henderson attributes the relative failure of Malaysian industrial development to problems with the state: 'The economic bureaucracy in Malaysia was highly fragmented and its core – the EPU – dominated by the whims of Mahathir and his cronies. The technocratic elite remained weak and any efforts to rationalise industrial policy were consistently undermined by the political elite's own interests, including their own personal financial interests. The consequence has been a relative absence of linkages between the industries spawned by the ISI and EOI strategies ... little serious technological upgrading has occurred ... and evidence of adequate skill development ... is slim.' (Henderson: 343)

While Henderson describes Malaysia's developmental state as 'stillborn', Malaysia's response to the AFC was politically exemplary, with Mahathir denouncing foreign speculators and imposing capital controls in defiance of IMF advice. As *Fortune* (13/8/01) noted, 'Even the controversial imposition of capital controls in late 1998 seemed to work. GDP grew by more than 8% last year.' A more realistic mood on the part of the Malaysian state can be seen by its accepting low-tech call centres into its Multimedia Supercorridor, (*BsWk* 13/5/02) but Malaysia still faces problems from its failure to deepen its industrial structure, and competition from PRC for FDI.

Development of the petrochemical sector

As a result of the state's attempt to attract foreign capital, Malaysia has been a target for Japanese chemical FDI. The major Japanese petrochemicals' push into Malaysia occurred in the 1970s, as part of a 'second wave' of Japanese foreign direct investment projects which 'came to exploit Malaysian resources. It rose in the 1970s following the oil crisis and then gradually tapered off in the 1980s ... A wave of investments in chemicals, particularly polluting ones, accompanied the quest for raw materials.' (Steven: 51)

The state welcomed such inward flight and from the beginning planned petrochemical development. In 1974, when the big push into Malaysia by foreign capital began, the government hired Italian company ENI to survey the possible development of refineries, petrochemical and fertiliser plants. (*BsWk* 30/3/74: 38-39) By 1978 there were twenty

Japanese chemical firms operating in Malaysia, the second largest sector of Japanese investment in Malaysia. (Golley: 17) By 1986 Japanese FDI accounted for 44.2% of capital in plastic products, followed by Singapore with 32%, while US FDI led in chemicals at 26.6%, followed by England at 20.4% and Singapore with 15.3%. (Ali: 88)

This government welcome led to a major growth in chemicals production locally. In 1981 Malaysian chemical industry output reached 7232.8 ringgit ($535 million), of which some $185.9 million was exported. (Abdullah: 294) The chemicals industry is now the third largest exporter after electronics and textiles. (KS: 16) Electronics has grown from a 3% share of manufactured exports in 1970 to 58% in 1991, having reached 50% in 1985. By comparison, the share of chemicals dropped from 32% in 1970 to 6% in 1991, though the increase in production can be seen in an increase in value from $M194 m in 1970 to $M3539 m in 1991. (KS: 16)

The chemical industry's main market is supplying industrial customers in its own country, with only 22% of gross output exported.

FDI in the chemical industries increased from $31 million in 1980 to $639 million in 1990, while the coal and petroleum sector saw a jump from $1 million to $999 million in 1990. (*OECD Obs* 185: 31, Dec 93) Despite this level of investment, foreign capital was not the dominant capital in either of these industries, nor in plastics products: foreign ownership in chemicals and chemical products was 32%, 43.11% in petroleum and coal and only 12.87% in plastic products in 1993. (Ali: 85)

While Malaysia welcomed FDI, 'a degree of selectivity is developing and the preference will be for investments that are technology and capital intensive: this would include most petrochemical and other chemical industry operations according to an industry analyst.' (*CMR* 23/9/91: 20) Chemical companies already in the country include Akzo, Shell, Monsanto, Toray and Henkel. Average annual growth in the sector was 8.7% between 1985 and 1990, with a projected annual growth rate of 8.3% between 1991 and 1995, with growth falling to 7.8% in 1995. (*FEER* 16/4/92: 51)

Malaysia has also been a target for hazard export from Taiwan with FDI from China General Petrochemical Corporation (CGPC) and the Chao Group, with the largest Taiwanese investor being China General Plastics, with $430 m invested. Another joint venture is investing M$1.35 billion in a complex in Johor due on-line in 1993. 'With the joint venture's

Taiwanese connection, it is expected to attract dozens of small manufacturers looking to flee their home island's steep wages and increasingly tough environmental standards.' (*FEER* 17/10/91: 109) Taiwanese companies have been singled out as the foreign investors most likely to flout environmental regulations, with Gurmit Singh, president of the Environmental Protection Society of Malaysia (EPSM) saying, 'Most of these Taiwanese are people who do not have a terribly good environmental record – especially those in the petrochemical industry.' (*FEER* 18/3/93: 46) Another Taiwanese joint venture, Titan Petrochemical, has a naphtha cracker and other units at Pasir Gudang.

Petrochemical development continued throughout the 1990s, with the first gas cracker, a joint venture between *BP* and Petronas, coming onstream in 1995 at Kerteh in Terengganu state. Kerteh over the past twenty years has had 70 billion ringgit ($18.4 billion) invested in it, some 40 billion ringgit of which was FDI. The area now boasts six gas plants, a refinery and 11 petrochemical plants. (Reuters 9/5/02; *ACN* 2/10/95, 10/3/97, 7/7/97)

Electronics: Just another toxic industry

One major source of toxic development has been the electronics industry. 'The solvents, hazardous chemicals and even radioactive gases used during the manufacture, assembly and testing of semiconductors present a constant danger for the workers.' (Stockton: 65) There are currently 150,000 women working in the Malaysian electronics industry: 'In terms of hazards at the workplace, workers find they have very little recourse: visits to company doctors result in dispensing of aspirin and suggestions that workers should rest and then return to work.' (*MM* Nov 93: 22)

A pattern of deaths associated with long-term electronics work has been suggested by women's groups, who also 'emphasise that many more have been sent home to die – back to the villages, back to their families – but with no explanation of the medical complications, no compensation and no responsibility taken by the people who are in the best position to know.' (Stockton: 67) There has reportedly been a rash of apparently work-related deaths at Texas International but 'information is scarce as the company provides good life insurance plans for workers, and workers' families stay silent for fear of losing insurance payments.' (*MM* Nov 93: 22)

The industry also poses a major problem regarding waste disposal: 'The lack of attention to the potentially disastrous threats seems to be

exemplified [in] an incident in January of 1991 involving a little boy who was walking outside of one of Kuala Lumpur's Free Trade Zones, carrying his father's lunch. The boy slipped and fell into a drainage ditch, which led to his death. However, the boy did not drown in the liquid waste; newspaper reports confirm that he ignited when he fell into the ditch, and died from burns. The follow-up story of his death reported government officials assuring that if the company were criminally negligent, it would be taken to court – and the story ended there, at least in the state-controlled newspapers.' (Stockton: 67)

Industrialisation = environmental crisis

Rapid industrialisation has brought major environmental costs: 'Major physical development of natural resources and rapid industrialisation in the 1960s and 1970s have definitely taken it's (sic) toll on the environment. Indiscrete urbanization, agro-forestry, mining and industrial development, in particular, have resulted in serious degradation of the environment over the last twenty years ... the problem of pollution from newly established industrial parks has brought about adverse environmental consequences and severe social strains. In fact, environmental crisis became the norm in the 1970s as a result of the continual attack on natural resources and environment.' (Nor: 132)

Some detail of the crisis can be seen in Guinness' report on the environmental effects of industrial development at Pasir Gudang:

'The air pollution around Pasir Gudang has long been a source of complaint from its residents, who instance the smog that hangs over the nearby factories, and the rapid deterioration of motor-vehicle bodies. The siting of factories did not take account of the location of residential areas, with the result that a number of chemical and fertiliser plants are situated on the road immediately adjacent to the residential area and its local shopping complex ...

'Pollution has also affected the waters of Johore Straits separating Johore and Singapore. Fishermen from villages both to the east and west of the industrial area have complained periodically of poisonous substances that have killed fish and prawns in nurseries and breeding grounds. None of these complaints have been satisfactorily investigated by the relevant government departments.' (Guinness: 205-206)

Nor is this pollution confined to Pasir Gudang. For instance, forty-two rivers have been officially declared 'dead' due to pollution by indus-

trial waste or sewage. (*EST* 27(12): 2271, 1993) The number of very polluted rivers increased from three of eighty-six in 1989 to sixteen of 120 in 1998, while only thirty-three rivers were considered clean in 1998, compared with forty-nine in 1989. This widespread pollution is only to be expected given that less than 10% of all industries are reported to be able to meet the industrial effluent limits laid down by the Department of the Environment. (*BsAs* 28/3/94: 2)

State regulation

As in many other countries, legislation to conserve nature and the natural environment is not lacking: what is lacking is enforcement of this legislation. Thus a member of the Environmental Protection Society of Malaysia notes, 'Although the Environmental Quality Act and the Pesticides Act are more than thirteen years old, their overall impact on environmental quality is inadequate. There are many loopholes and even enforcement has been patchy.' (Singh: 28)

There are over thirty pieces of legislation protecting the environment in Malaysia. In 1972 the government enacted the quite strong Environmental Quality Act (EQA). But 'inherent institutional weaknesses and lack of political commitment still hampers rigorous control of environmental abuse.' (*FEER* 29/10/92: 32)

Until the mid 1990s the situation was extremely unsatisfactory. Fines for pollution offences were too small – the maximum was M$5000 ($2000). The Department of the Environment lacked both staff and clout and thus its objections to projects on environmental grounds were easily overruled by stronger pro-development departments.

One industry publication reported, 'Like in many other East Asian countries, the monitoring of limit values is either too lax or even non-existent. Licensing procedures for potentially pollutive industries and EIA (a requirement for projects financed by the World Bank) display considerable flaws. The public has yet to be adequately included in the licensing process, and the continued rapid industrialisation of the country and economic growth still have priority over environmental protection.' (*EBB* 301: 6) Another industry publication, while reporting a toughening of EIA requirements, noted, 'Developers still ignore environmental conditions once development approval has been received.' (*BsAs* 19/7/93: 11)

Even when violators were prosecuted, fines were risible: 'Of forty-nine successful prosecutions nationwide in 1993 – the majority related to waste dumping in inland waters – fines amounted to just M$156,200 ($61,255). It is cheaper to flout the law than abide by it, it seems; smaller local companies, in particular, commonly prefer to pay fines over investing in pollution abatement technology.' (*BsAs* 11/4/94: 2)

The situation was vastly improved by amendments to the EQA in 1996. For example, fines for pollution of air, soil and inland waters were raised to $30,000 and/or five years in jail from the previous $3,000, while fines for discharge of waste into Malaysian waters were raised to $150,000 and/or five years jail from $3,000 and/or two years jail. State regulation increased with, for example, environmental offenses prosecuted under the EQA rising from fourteen in 1980 to forty-five in 1991 and 256 in 1996. (Rasiah: 17) Similarly the Department of the Environment's budget allocation rose in 1997 to $80 m from $6.8 m in 1995 and $13.6 m in 1996.

Environmental impact assessments

An examination of EIAs submitted to the Department of the Environment found that all or nearly all were conducted by government or quasi-government agencies, while 'the so-called private sector has responded rather unfavourably towards EIA.' (Nor: 133) The response by the Federation of Malaysian Manufacturers (FMM) has been to warn that the EIA process will 'drive off investors, ruin the nation's industrialisation plans and create unnecessary delay.' (Nor: 137)

In reality the FMM has little to fear from the EIA process. 'There is no transparency in the process, therefore it is subject to abuse,' in the words of a Malaysian environmentalist. (*FEER* 29/10/92: 34) In certain cases an 'EIA is conducted to accommodate projects rather than force shifting of locations or changing of engineering design,' (Nor: 136) while most EIAs have failed to adequately address alternatives to the proposed projects. On a more basic level yet, 'It is difficult if not impossible to evaluate EIAs submitted to the Department of the Environment because of their confidentiality. EIA reports are classified documents and thus are not accessible to the public.' (Nor: 133) Another observer notes, 'The majority of EIAs and studies done for state governments are kept away from the public.' (Singh: 27) The first call for public comment on an EIA occurred appropriately enough on 1 April 1989 regarding a proposed titanium dioxide unit. (Singh: 28)

Toxic waste

A government survey in 1984 estimated hazardous waste generation at 280,000 cubic metres a year. A further study in 1987 estimated annual hazardous waste generation at 377,000 cubic metres, an increase of over a third on the 1984 survey. This survey concluded that 647 industries were potential generators of toxic waste. The industries surveyed were mainly located on the west coast of Malaysia from Penang to Johore. Three states – Penang, Selangor and Kuala Lumpur – were responsible for generating 65% of all toxic waste, with some 31% of it produced in Selangor. Toxic waste generation in Malaysia is expected to grow 8% annually in parallel with the country's economic growth, and in 1992 was estimated to be 432,000 tonnes. (*Sarawak Tribune* 18/1/92)

In 1989 the Malaysian government introduced regulations to control the storage, treatment, transport and disposal of hazardous wastes. While there are thousands of existing on-site disposal facilities, the Department of the Environment does not have the resources to licence them, according to Ibrahim Bin Shafii, a Department official speaking in 1993: 'Disposal of solid industrial and domestic waste takes place throughout the country. None are suitable for hazardous wastes as they are often poorly managed and poorly sited both geologically and hydrogeologically.' Although the Department has been searching for acceptable disposal sites since 1981, it had yet to find one which is both environmentally and politically acceptable. While the Department has examined some 90 sites, 'the NIMBY syndrome is also widespread in Malaysia,' according to Bin Shafii, and the states have until now rejected all such proposed sites. (*HazNews* February 1993: 18-19) A proposal to use Valdor in Penang for a new central toxic waste plant was rejected following protests from residents.

While the search for a site continued, illegal dumping was widespread. Late in 1991 Malaysia banned fishing off the western town of Pantai Remis when nearly 1600 tonnes of toxic waste was found dumped there. A report by EPSM found toxic waste to have been illegally dumped at public dumps as early as 1986. EPSM president Gurmit Singh told the *Sarawak Tribune* (18/1/92), 'Most of the factories do not care how or where the wastes are disposed of. Their worries end as soon as the contractor departs with the wastes.'

In March 1992 the government announced plans for a national waste collection and disposal system, modelled on the Danish national waste

management company. The disposal centre, which will deal with 300,000 tonnes annually, is to be sited in Bukit Nanas, near Port Dickson, south of Kuala Lumpur. Management of the $80 m plant, including landfill and incineration, went to a Malaysian/Danish consortium. The landfill began operating in 1997, while the contract for the incinerator went to Sumitomo in 1996.

Jorgen Plong, chief negotiator for the consortium, said the plant was necessitated by Malaysia's 'almost explosive industrialisation'. The major waste generators in Malaysia are large petrochemical companies and refineries. 'Up to now, most of the waste has simply been dumped,' according to Plong. (*HazNews* Mar 92: 17)

Local residents in the area formed the Bukit Nanas Anti-Toxic Dump Committee to oppose the threat of air and water pollution. Their opposition has suffered from the lack of press coverage. According to Low Foot San, chairperson of the Committee, 'Unless the international community comes to our aid, we will become the direct victims of industrial development in Malaysia, as our right to be consulted and to free speech has been violated by a total national media blackout.' (*TTU* 6(2): 32)

The incinerator was commissioned in 1998. By the end of 2000 it had received 216,500 tons of waste. But despite the availability of the incinerator and government regulations requiring correct disposal of waste, companies continue to dump indiscriminately. In October 2001, thirty families were advised to evacuate when toxic waste was dumped by lorries near Kampung Seri Keramat 5 in Klang. Local vegetation was affected and two residents were treated in hospital. (*Star* 15/10/01) Speaking earlier that year the Director of the Selangor Department of the Environment said, 'We have many cases where factories were charged in court with disposing scheduled waste at unauthorised sites, rubbish dumps and burying inside factory premises.' (*NST* 24/4/01) None of this is surprising as industrial waste can be collected by contractors who do not need special licences. As Gurmit Singh says, 'The waste disposal problem is at least 30 to 40 years old and the reason has always been the same ... it is a serious lack of enforcement, where the local authorities do not even monitor the sites.' (*NST* 24/12/01) A recent survey reported only 22% of the 3000 factories generating toxic waste were registered with the Bukit Nanas operation.

Malaysia does not appear to have been a major target of hazardous waste exports. According to Greenpeace research, between 1990 and

1993 Malaysia imported 3780 tonnes of hazardous waste and 522 tonnes of plastic waste. (Greenpeace: 5)

Occupational safety and health

A recent review of occupational safety in Malaysia reported, 'Malaysia has a high prevalence of industrial accidents and extensive underreporting of occupational disease.' (Khor: 50) The reasons behind this state of affairs can be summarised in Khor's words: 'In Malaysia, as in Japan, the basic problem is the competing interests of public health concerns, on the one hand, and economic and political priorities, on the other. The limited power of unions and the majority of non-unionised workers contribute to inadequate attention to occupational safety and health.' (Khor: 62)

Problems in the electronics industry have already been discussed. In general, conditions in EPZs have been hazardous: 'Many workers, however, their health permanently damaged, have been forced to leave; workers often complained of headaches, failing eyesight, sore eyes and backstrain.' (Rasiah: 123)

In 1980 the *Wall Street Journal* found the same appalling lack of concern for workers' safety both in US- and Japanese-based MNCs' local operations, reporting symptoms of arsenic poisoning at a Diamond Shamrock pesticides factory, high exposure levels at a Japanese-Malaysian joint venture producing PVC and reporting the Malawata Steel Mill to be the filthiest and most dangerous factory in Malaysia, 'which probably wouldn't be allowed to operate in Japan.' Similarly, cotton dust, noise, chemical dyes and safety hazards were rife at the India-Malaysia Textiles factory, owned by the Birla Group of India. 'Workers there who complained were told things were worse in India.'

Government officials admitted the overriding objective was to attract foreign investors. One government doctor said the first question asked by investors was, 'What regulations do you have and how well do you enforce them?' Investors were no doubt pleased to hear that injured or ill workers are generally barred from suing employers for negligence. Lee Chee Wing, deputy head of Malaysian social security, said, 'We don't need any more litigation. We believe the employer needs a little protection.' (Newman)

In 1988 the chemical industry accounted for 10% of accidents, 10.2% of permanent disablement and 12.5% of deaths due to industrial acci-

dents in Malaysia. (Khor: 46) Similarly, Malaysian workers have been exposed to a great range of hazardous substances. 'Clinical studies in the past have found high levels of hazardous biological and chemical contaminants in workers from industries and plantations.' (Khor: 54)

Some regulations have been brought in to try to tackle occupational safety and health hazards. Khor noted in 1992, 'Regulations on occupational health and safety exist, but rigorous enforcement is lacking because of several reasons. There are not enough trained professionals and other resources to enable the enforcement agencies to carry out their duties effectively.' (Khor: 60-61)

Thus there has been little change in the situation over the period of industrialisation. 'A national seminar on "Hazardous Industries and Workers Health" held in 1984 drew wide participation by workers, unionists, academicians, and international consultants. Several pertinent occupational health and safety problems which were highlighted still beset the industries today.' (Khor: 55)

More recently, a MTUC report found Malaysia has one of the highest numbers of industrial accidents in the world, with nine industrial accidents occurring every hour, and 500 people dying from industrial accidents each year. Furthermore, a recent CAP/SAM report found industrial accidents in Malaysia had increased from 61,939 in 1980 to 107,479 in 1989. (Tang: 4-5) The toll rose to 124,008 in 1990. (*WHIN* 44: 5)

Burning factories

On 7 May 1991 the burning factories syndrome ignited in Malaysia as well. The Bright Sparklers Sdn fireworks factory in Sungei Buloh outside Kuala Lumpur, believed to have been operating illegally for fifteen years, was destroyed by a series of explosions which killed at least twenty-four people and injured 100. A local fire chief said the workers had no chance of escape. Residents of squatter houses near the factory also perished during the blaze. (*Guard* 8/5/91: 8; *CEx* 8/5/91: 13)

The largest shareholder in Bright Sparklers was local Malaysian company Tawa Holdings, though Singapore and Hong Kong companies also had minor holdings. Former Finance Minister Datak Daim Zairuddin was a passive investor. Uncharitable people suggested this may be the reason why Bright Sparklers 'had been allowed to stay in operation despite a series of accidents, some fatal, since 1978 and numerous complaints by nearby residents.' (*FEER* 23/5/91: 21)

The disaster also focussed attention on a 'gigantic problem in industrial safety that has so far been improperly addressed or ignored; there are an estimated 2000 illegal factories in the Kuala Lumpur area alone, and more than 3000 in nearby Selangor state.' (*FEER* 23/5/91: 21)

The environmental movement

Beginning in the 1970s, environmental groups began to organise, with the Consumers Association of Penang (CAP) established in 1969, Environmental Protection Society of Malaysia (EPSM) in 1974 and Sahabat Alam Malaysia (SAM) in 1977. Demonstrations organised by SAM and CAP over pollution of the Juru and Kedah rivers were repressed by the government who denounced them as unlawful. CAP and SAM organised a major environmental conference in 1978 and, despite state disapproval, environmental issues have refused to disappear, with concern over air and water pollution, as well as logging, growing over the period.

Malaysia's environmental movement has suffered strong state repression at different stages. On 9 April 1981, an amendment to the Societies Act made it illegal for environmental organisations to attempt to influence government in any way. This followed investigations by environmental groups into subjects such as safety at the mainly government-owned Malawata steel complex, mining disasters in Selangor and herbicides. (*NS* 16/10/80: 144; 9/4/81: 71; 30/4/81: 271) The new regulations made it illegal for groups to make demands of the government or to involve foreign environmental groups or use funding sources from outside the country.

The next major repression of environmentalists occurred in October 1987 when two environmentalists were arrested under the Internal Security Act. Brookfield reports that ten leaders of environmental groups were arrested and cites another result of the repression: 'The frequent publication of well-informed articles in the Malaysian press has been a casualty of these events.' (Brookfield: 285) The reasons for this crackdown were both ideological and venal: 'The "greens" have, in fact, violated a fundamental rule that earlier governed their activities; they have questioned the basic philosophy of national development in taking on the timber industry and allying themselves with well-financed international movements. Moreover, they implicitly threatened the interests of powerful people with influence in very high places.' (Brookfield: 285)

Since those arrests, environmentalists have faced a situation of nearly complete black-out in the media. The increasing repression is described by EPSM member G Singh: 'From the moment it began in the early

1970s, the environmental movement has been penned in by very severe restrictions ... We have never had easy access to studies done by government agencies since they are covered by the Official Secrets Act, which was further tightened in the mid 1980s. Demonstrations and public meetings are now almost impossible since prior written police permission is required for a gathering of five or more persons.' (Singh: 26)

In the 1990s relations between the Malaysian state and environmental organisations improved, with the state even inviting environmental NGOs and university experts to participate in planning sessions to improve environmental standards, while blocks on NGOs influencing government policy and receiving money from abroad were removed. However, while constructive involvement on the state's terms was welcomed, opposition to development projects was not, with Mahathir remaining highly disapproving of critical NGOs. Speaking in Kuala Lumpur in June 2002 he attacked foreign-funded NGOs for opposing development projects, describing them as 'traitors to the nation and the people'. (*NST* 5/6/02)

Despite these difficulties environmentalists continue operating, with demonstrations by villagers along the Sungai Jernih river calling for an end to toxic pollution of the river in 1990. (*NST* 4/10/90) More recently, opposition to waste disposal schemes has grown. In December 2000, for example, some 200 residents of Rantau Panjang protested against the setting up of a waste site in their community. (*Star* 22/12/00) With the state embracing incineration as a technical fix for waste, opposition to incineration is growing, with CAP organising a signature campaign against the toxic technology. Introduction of incineration coincided with the privatisation of waste disposal in the mid 1990s. While five regional incinerators have been constructed to deal with medical waste, another three have been delayed by opposition from local authorities.

Similarly, environmental pressures are beginning to influence location decisions in Malaysia. Thus Petronas' first proposed site for its 594,000 tpa ammonia and urea plant was abandoned due to environmental problems. In a move which echoes the location of nuclear power plants near foreign borders in Europe, Petronas has now relocated its proposed plant to near the Thai border. (*ECN* 26/7/93: 26)

9

Indonesia
New order, old problems

Stimulating and facilitating Indonesia's economic development has been the principal objective of the New Order Government since it came to power in 1965-66. (UNIDO: 14)

Of all the East Asian economic miracles, the Indonesian one is the one most drenched in blood. 'In the massacre of 1965-66, a minimum of 600,000 were murdered. If the reported deathbed confession of Sarwho Eadie to Mae Permadi is true, the number may have reached over two million. Between 1977 and 1979 at least 200,000 human beings in East Timor died before their time, either killed directly, or condemned to planned death through systematic starvation and its accompanying diseases. Amnesty International reckons that 7000 people were extra-judicially assassinated in the Petrus Affair of 1983. To these victims, we must add those in Aceh, Irian, Tanjung Priok, and elsewhere. At the most conservative estimates: 800,000 lives.' (*NLR* 3: 12)

The beginning of the New Order lay in massacre during and after a supposed preemptive coup against the Communist Party of Indonesia (PKI), which involved the death of hundreds of thousands of people and wiped out any organised working class opposition to the New Order project, incidentally also targeting Indonesia's Chinese merchant class. Since then, Indonesia's New Order elite has continued to show its readiness for coercion, whether in the murder of a troublesome trade unionist by army-affili-

ated agents, the suppression of indigenous rights in West Papua or Aceh or the sustained genocide involved in the colonisation of East Timor. Economic development has been identified by the military as a matter of national security priority; opposition to it – whether on labour or environmental grounds – is then easily seen as something close to sabotage. Given the closeness of sections of the state and military elite to these development projects and given their widespread corruption and contacts with gangster elements, opposition to economic development could indeed become a hazard to one's health.

Thus, from the beginning, industrialisation in Indonesia has been seen as a matter of national security, sovereignty and pride. The state apparatus contains a strongly nationalistic, pro-local and pro-state capital faction which has, in more recent times, clashed with another, more technocratic faction. Given the strong control of the economy by the state, including such lucrative rent-creating opportunities as issuing of licences, the development of the economy has included the development of the economic interests of the President's family and friends, the creation of a Golden Circle, not dissimilar to the economic activities of the red princelings in the People's Republic of China. While this monopolisation, nepotism and favouritism has been a continuing characteristic of Indonesian industrialisation, following the oil price drop, with its restrictions on state capital spending, and recent moves towards deregulation, certain monopolies are no longer as secure as before, and, following reforms, even the Suharto family and its cronies are no longer immune to the reach of law.

Business Week reported that the First Family was immune 'to the range of obstacles that pop up mysteriously in dealing with government officials in a country considered one of the most corrupt in Asia. Without explanation, senior officials are unavailable for meetings, licences are not issued in time for deals to be signed, or documents required to import equipment don't get processed.' (*BsWk* 21/10/96: 26)

The First Family, the Suhartos, include his daughter Tutut, with estimated assets in 1994 of $454.5 million, daughter Titiek with assets of $109 million and sons Sigit ($454.5 million), Bambang ($2.18 billion) and Tommy ($590 million). With a family empire estimated conservatively at $4 billion, it is no wonder that 'it is well-nigh impossible to get a deal done without a Suharto clan member as ally, agent or partner.' (*BsWk* 19/8/96: 24-25). Of course the jam spreads wider, if thinner: 'Prac-

tically every big Indonesian businessman, military leader or politician has benefitted from patronage.' (*BsWk* 19/8/96: 25)

Here of course the corruption combines with military involvement. 'Military leaders pioneered the nationalization of Dutch companies, most importantly taking a dominant role in the oil company, PERTAMINA.' (Tjahjono: 17) This major military interest in Pertamina led to major 'national prestige' investments in resource based industries, and provided support for nationalist economic policies. As in other Asian countries, sections of the military are involved in illegal business activities: 'Logging companies usually work with military people in carrying out illegal logging, so it is difficult for the officials in the field to refuse to participate in illegal activities.' (Tjahjono: 19)

Government economic development policy in Indonesia has varied widely over the past four decades, but the place of industrialisation in this policy has never been questioned. Following independence, Indonesia had a very limited industrial base: 'The development of manufacturing industry began to be given high priority soon after Indonesia obtained independence ... and has remained a principal objective of successive governments of Indonesia throughout the post-Independence period.' (UNIDO: 23)

The policies to implement this industrialisation have varied, with tension between two factions, the technocrats who 'focussed on the use of economic efficiency criteria for determining the pace and pattern of the industrialisation process' and the economic nationalists who 'viewed economic growth as a means towards achieving essentially non-economic objectives.' (UNIDO: 23) Crudely, these two groups may be considered to support Export-Oriented Industrialisation and Import Substitution Industrialisation respectively.

In the first period, during the mid 1950s, prior to the New Order, Indonesia attempted industrialisation on the state socialist model, with technical and financial support from the state socialist bloc. However, this impractical policy came to an end with the introduction of the New Order in 1965/1966, after 'several years of economic turmoil and decline' led to reassessment of the country's economic policy. 'In particular, the management of the economy was handed to a group of academic economists, who came to be known as the "technocrats" and whose principal objective was the achievement and maintenance of economic efficiency and competitiveness. With foreign advice and financial assistance

these technocrats were able to introduce policy measures which permitted the restoration of economic stability within a relatively short space of time.' (UNIDO: 14) We hardly need to add that these academics were US-trained.

Even so, state involvement continued to play a large part in the economy and nationalist sentiment was often conspicuous in industrial policy. The state followed a twin-track industrialisation policy, involving growth of both the private and state-owned sectors. By the mid 1980s firms with government equity participation made up 50% of industrial firms. (UNIDO: 25)

State involvement in economic activity is still strong: 'The government also plays a significant role in the manufacturing sector, with firms owned wholly or partially by the government accounting for 25.5% of total MVA (manufacturing value added) at the time of the 1986 industrial census.' (UNIDO: xx) State firms have tended, in the Stalinist style, to be large companies in basic industries, leading to what was described as 'upstream socialism, downstream capitalism'. They also tend to be in the commanding heights (or depths) of the economy. State-owned firms 'accounted for more than 50 per cent of Indonesia's total output of basic chemicals, oil and natural gas products, basic metals and non-electrical machinery.' (UNIDO: 61)

The economy has shown strong growth rates. 'The Indonesian economy has experienced a period of dramatic growth and structural change during the 1980s and early 1990s. From being a largely resource-based economy until the mid 1980s, in which the agricultural sector accounted for the bulk of domestic income and employment creation and the mining sector for the greater part of export and budgetary revenues, it now has a much more diversified and balanced structure.' (UNIDO: i) Since 1985 the Indonesian economy has shown growth rates averaging over 6% per annum, with manufacturing showing particularly strong growth of over 10% per annum, and non-hydrocarbon-based manufacturing growing even more rapidly at 12%. (UNIDO: i)

Indonesia has also successfully diversified its production, in the same way as the North Asian NIEs: 'The dramatic growth in manufacturing output recorded during the past two and a half decades has been accompanied by an equally remarkable degree of output diversification.' (UNIDO: 40)

Indonesia has also followed the Asian model in the importance of female labour and women have comprised between 45% and 50% of the labour force in manufacturing since the early 1970s. (UNIDO: 55) This gendered division of labour has led to gendered payment systems: 'More than half of the working women work part-time in Indonesia, and most women are in low-status, low-paying jobs since they lack the skills and educational qualifications for better jobs. Women at managerial and decision-making levels are very few. Even when educational qualifications are the same, women are paid far less, on average, than males. The sex differential is greatest among women workers with the least formal education, but even among academy and university graduates males earn 40 per cent more than their female co-workers. The same pattern holds when male and female workers are matched for hours of work, type of occupation and field of work.'[1] (UNIDO: 56)

Female participation in the labour force can have other non-beneficial effects, up to and including being worked to death. In March 1996 it was reported that one worker at a factory producing Reebok shoes in Tangerang died after being forced to do overtime while sick. The woman's death was instrumental in highlighting the brutal discipline and long working hours imposed by Korean management in many of Indonesia's garment and shoe factories. One worker at Pratama Abadi Industrial, which produces Nike shoes, said, 'The only rest you get is after you collapse at your machine.' (*WHIN* 47/48: 17)

These problems have not gone away. A report produced by Global Alliance in February 2001 and funded by Nike said of conditions at nine of the most progressive subcontractors of Nike in Indonesia that 56% of workers reported witnessing verbal abuse, 15.7% sexual abuse and 13.7% physical abuse. Other complaints included forced overtime and limited access to health care at work: 'Many [workers] said their supervisors allowed them to visit clinics only after they had collapsed.' (*Guard* 23/2/01: 17; *WSJE* 22/2/01: 1,8)

Japan has been the major investor in manufacturing in Indonesia, with its investments growing by leaps and bounds after 1972. In 1972 Japanese investment in Indonesia was $58,504 million. This rose to $236,269 million in 1973 and to $241,058 million in 1974. In 1975 Japanese investment fell to $61,344 million but in 1976 it rose again to $152,314 million. (Robinson: 205) One observer comments, 'Clearly it is not inaccurate to characterize foreign investment in manufacturing in

Indonesia since 1966 as basically Japanese investment ... The Japanese presence in Indonesia parallels – and perhaps exceeds – that of the US in parts of Latin America in terms of country shares.' (Hill: 59-60) 'Japan's pre-eminent position is due mainly to its huge investments in basic metals ... most of the American and European investments have been in chemicals and metals goods.' (Hill: 60) The major US investment has been in oil production, with some 80% of foreign investment in this sector coming from American firms. (Hill: 54) By 1976, Japan's investment in chemicals was $19 m and in textiles $136 m. (Robinson: 216)

Development of the petrochemical sector

Indonesia was in a strong position to push petrochemical development due to its massive energy reserves, being the largest south east Asian producer, the sixth largest OPEC producer and thirteenth largest world oil producer. It also has massive reserves of natural gas, of which it is the number one exporter in the world. Despite these advantages, Indonesia has lagged behind other countries in the region in petrochemical development. Still, recently both intermediate and downstream petrochemical capacity have grown: 'Much of it built as joint ventures between various parts of ... Indonesian business groups and foreign chemical firms.'[2] (*FEER* 7/11/91: 56) Ethylene demand in 1996 was 1.3 billion lbs, PVC 660 m lbs and fibre intermediate PTA was 3.78 billion lbs. Before the AFC struck, the estimated demand for 2000 was 1.88 billion, 880 million and 4.85 billion lbs respectively. (*CEN* 11/8/97)

Foreign capital was important in the growth of the chemicals and rubber sector. Between 1965 and 1975 some $192.2 m of FDI went into the sector, which increased to FDI of $222.2 m in the period 1976 to 1980. (*Forbes*: 114)

Foreign investment in chemicals for the period was $589 million of which $211 million was foreign equity and $379 million was foreign debt. (Hill: 82) Chemicals represented 19% of all manufacturing FDI from 1967 to 1985. (Hill: 83)

Nonetheless, it would be wrong to see petrochemical development as under multinational control. SOEs feature strongly in certain strategic industries. Thus, in the huge local fertiliser industry, SOEs accounted for 99.6% of fertiliser output in 1983. While this share has since declined somewhat, the government is still overwhelmingly involved in this sector. (Hill: 25) Some indication can be found in statistics showing gov-

ernment ownership in industrial chemicals being 93% in 1975 and still at 72% in 1983. In the plastic products sector, local private capital owned 86% of the industry in 1975 and 71% in 1983. Only in the other chemicals sector did FDI loom large, 50% in 1975 and 61% in 1983. (Hill: 23)

Chemical FDI in Indonesia has increased in significance. In 1991, approved foreign investment in Indonesia amounted to $8.78 billion, including $922.9 million (over 10%) in the chemical industry, the most important sector for FDI. (*EBB* 262: 12) In 1993, according to Bank Indonesia, approved foreign investments included $1.2 billion in chemicals and pharmaceuticals. (*CMR* 12/9/94: 24) In 1996, 35% of all FDI went to the chemical industry, while of $16.2 billion FDI in the first six months of 1997, 43% went to the chemical industry. (*CEN* 11/8/97)

Since the AFC however, chemical investment in Indonesia has been shut off, with various projects delayed, such as the TPPI $2.3 billion complex at Tuban which was suspended in January 1998. *BP* summed up Indonesia as too important to give up on, but not stable enough to invest in. As a Du Pont executive put it dryly, 'Periodic adjustments will need to be made by organisations interested in a long-term presence in Indonesia.' (*CEN* 28/6/99: 18) In April 2001 a BASF executive said, 'There is no confidence currently in the mid-term future of the country.' (*CEN* 9/4/01: 19)

By 1988 Indonesia had three oil refineries, urea production had reached 5.27 million tonnes per year, while ammonia output was 2.99 million tonnes per year. (Rigg: 180) By 1990 the chemical industry in Indonesia consisted of 56 basic chemical plants, including petrochemicals, fertilizers and cement complexes, with annual production valued at $4 billion, of which more than $550 million was exported.

Indonesia's chemicals sector was valued in 1991 by industry analyst P Logan at $1.3 billion.

'The growth of these industries has been a major objective of government policies since the mid 1970s, but the implementation of the many ambitious plans drawn up in pursuit of this objective has frequently had to be postponed because of the heavy investment costs involved. The increasing efforts to attract private investments into the industry since the mid 1980s have helped to ease some of these financial constraints.' (UNIDO: xxii)

Outside of the giant SOEs in fertilisers, a strong indigenous chemical industry has not grown. In 1997 the Salim group, then the country's

largest business group with annual sales of $20 billion, reported it had stakes in plants producing PE, alkyl benzene, PVC, caustic soda, styrene, monosodium glutamate and pharmaceuticals. These were developed through relationships with *BP*, Dow, Mitsui, Sumitomo and Tonen, while the company was studying a cracker with *BP*, Mitsui, Nichimen, Sumitomo and Tonen. (*CEN* 11/8/97) Local companies with major investments in petrochemicals include the Bimantara Citra and Salim groups, which have built extensive projects, involving joint ventures with Dow, Arco, *BP*, Idemitsu Petrochemicals, Toyo Menka Kaisha and Asahi Glass. (*FEER* 7/11/91: 56)

Most chemical production is in Java, with concentrations around Merak in western Java, Cilicap in southern Java and Gresik, near Surabaya in eastern Java. The growth of the industry at Merak can be seen in the increase there of plants from two in 1990 to over forty in 1997. (*CEN* 11/8/97) The industrial zone around Lhokseumawe in Aceh is another area that has been chosen for the location of hydrocarbon-based industries. By 1983 the area had $9.5 billion invested, including a gas liquefaction plant (P T Arun), a urea plant (P T Asean Aceh Fertiliser) and another urea plant under construction. (*Forbes*: 136) Anyer in west Java is likely to become a major midstream and downstream petrochemicals centre in the next few years, with both Dow and Arco planning plants there.

One major complex is at Chandra Asri, Cilegon. The full complex involved an investment of $1.3 billion, including 550,000 tpa ethylene and 300,000 tpa propylene units. The project, almost mothballed after a government order in October 1991 postponed it, began construction early in 1993. The majority shareholding (75%) is shared between Pangetu Prajogo of the Barito Timber group, Bambang Trihatmodjo (Suharto's second son) and Henry Pribadi, a businessman with close ties to Suharto's family, with the other 25% being held by Marubeni and Showa Denko, the latter also being the facility's operator. *Business Week* reports that the Suharto connection was essential to the Chandra Asri project. 'One of Bambang's deals, a $2.4 billion polyethylene complex, is surviving only because of a stiff 20% surcharge on imports on top of the normal 45% tariffs. He built the plants with Siemens and Marubeni Corp. despite fierce resistance from government planners.' (*BsWk* 19/8/96: 28)

In 1999 the *Far Eastern Economic Review* described Chandra Asri as 'an expensive failure, too ineffective to compete on world markets and repay its own inflated construction costs.' This inflation, achieved through over-invoicing and kick-backs, meant the plant cost $1.8 billion, rather

than the $1.2 billion it should have. In 1999 it made a net loss of $49 m and, though recognised as uncompetitive, was being run at nearly full capacity. In 1999 also it was the state banking system's greatest bad debt, having defaulted on loans of $1 billion, while its debts to creditors in Japan and elsewhere were $1.7 billion. (*FEER* 13/5/99: 12-13) After debt restructuring left the Indonesian Bank Reconstruction Agency (IBRA) with 76% of Chandra Asri, IBRA negotiated a restructuring agreement in June 2000 with Marubeni, which had lent Chandra Asri $724 m and invested $250 m, but political factions denounced the restructuring as too favourable to the Japanese and IBRA had to ask for new negotiations. (*FT* 22/2/01: 29)

Chandra Asri was not unusual. An IBRA official said forty-one chemical companies were problem borrowers, though most of their plants were still operational: 'We cannot say they are for sale, because the current owners might get upset.' (*CEN* 9/4/01: 13) When Tirtamas went into receivership, IBRA found itself with 60% of the TPPI project, with the rest split 15% Pertamina and 25% Itochu, Nissho and Siam Cement. The state intends pushing the project to completion through a Japanese-led rescue. (*CEN* 11/3/02: 27) Similarly, Texmaco, having grown to be the fifth-largest PE producer in the world, ended up with $3.8 billion in debt, $2.7 billion to IBRA. The owner refuses to surrender and 'appears to have realised that the only way to resurrect his empire is by invoking nationalism. He says Texmaco is a "national asset", "a symbol of Indonesia's attempt to become an industrialised country".' (*FEER* 8/8/01: 87)

Industrialisation = environmental crisis

Villagers in Tambon Baroh, Aceh, in North Sumatra have suffered from pollution from two fertiliser factories nearby, P T Pupuk Iskander Muda (PIM) and P T Asean Aceh Fertiliser (AFF). Waste and dust from the factories have polluted vegetation, wells and rivers and killed fish and shrimps. Villagers travelled to Bhopal, India, to take part in the Permanent Peoples Tribunal in December 1992, arguing that they were living daily with a mini-Bhopal.

'In 1988 a serious ammonia leak occurred at PIM, during which many villagers fainted. The villagers sued the company but the district court at Lhok Seumawe ruled in favour of PIM. More major leakages from both plants have occurred on several occasions since then. Each time, the

companies offer villagers just two tins of powdered milk, some oranges and a small sum of money (between $1.60 and $3.20) per family.' (*DTE* 19: 16, December 1992)

Similar pollution problems adversely affecting public health were alleged in July 1993 in relation to P T Pusri's fertiliser factory at Palembang, for which the company offered compensation while denying responsibility. (*DTE* 22: 10) Health problems among residents of Duri Kosambi, Djakarta, have been blamed on the nearby BASF cassette factory. (*DTE* 22: 10)

Another area badly affected by pollution is Gresik, east Java, where the P T Petrokimia factory, among others, is sited. Research by WALHI has found that emissions at Greisik are higher than permitted. Research by Airlangga University found residents suffered from restricted pulmonary efficiency, chronic bronchitis, serious allergies, twice the average risk of miscarriage and general decline in children's health. Dr Ramli, a local government official, said their policy was to leave issues of health and safety to P T Petrokimia: 'The people of P T Petrokimia are the chemical experts and so they are the ones who better understand the issues concerned.' (*DTE* 23: 12, April 1994)

Water pollution is also severe. On the island of Java, where about 60% of all Indonesians live, more than 50% of all rivers are classified as 'heavily contaminated'. (*EBB* 308: 8) Some details have been provided by an academic observer: 'For example, many small- and medium-scale factories discharge effluents into the Ciliwung and Cipinang rivers in western Java, with a reported ten tonnes of chemical waste dumped daily into the latter. Pollution from pulp and plywood factories has had serious impacts on local fisheries, particularly in South Kalimantan.

Many similar problems include damage to the shrimp fishery on the Bekasi River near Djakarta by a paper factory, and pollution of farmers' irrigation channels from a major government-owned chemical factory, also near Djakarta.' (Boardman: 90) As for Djakarta Bay itself, it has been described as 'one of the world's most polluted coastal water areas [which] presents a major risk of serious environmental and economic damage associated with the destruction of fisheries and other marine and coastal resources.' (quoted in Boardman: 90) In 1981 Minamata disease, caused by mercury pollution, was discovered in Djakarta. (Cribb: 1125)

Government response

The first Minister for the Environment was appointed in 1978. In 1982 the government enacted the Act Concerning Basic Provisions for the Management of the Living Environment. While the Act made those responsible for pollution liable to pay damages and the cost of restoration, 'the act itself is basically unenforceable because it contains no enabling regulations or definitions.' (Cribb: 1127). In June 1986, government regulations set out the machinery and regulations for pollution control. These regulations specified procedures for payment of compensation to agricultural or fishing groups if their interests were damaged by an industrial project and set out sanctions against illegal pollution, including the possibility of a ten-year prison sentence or Rp 100 million in fines.

In 1978 a directive from the Ministry of Industry required all new industrial projects to carry out an EIA. From the beginning, however, the EIA was a flawed instrument 'since it makes no mention of legal consequences for those who ignore its stipulations.' (Hardjono: 13) As to the practical implementation, 'In the interests of encouraging expansion in manufacturing, especially if it is export-oriented, those responsible for the granting of business permits tend to ignore both land-use plans made at the municipality or district levels and the potential pollution effects on local residents.' (Hardjono: 12) Thus, as elsewhere in Asia, the position of those who live in an area being developed is of little consequence. While the 1982 Environmental Protection Act refers to community participation in environmental protection, 'the extent to which local residents can challenge government decisions is extremely limited, especially where large capital investments are concerned.' (Hardjono: 13) To conclude with EIAs, their usefulness for environmental protection is questionable: 'Initially, however, because of the loose terms of reference of the EIA requirement, there were no cases I know of where a project was stopped because of a report.' (Cribb: 1126)

In particular instances, Indonesia has shown itself willing to neuter all its environmental regulations for the sake of economic development. In these cases, even the rhetoric of environmental protection is abandoned. For example, Batan island in western Indonesia, due to its close proximity to Singapore, is being developed as a free trade zone and potential investors were assured that the existing Indonesian environmental regulations would not immediately apply. (MacAndrews: 376)

The general response of capital to environmental regulation is unsurprising: 'Due to its size and influential connections, business generally does what it likes as far as the environment is concerned. If regulations exist, business will, if necessary, pay some attention to them; if they do not, business will ignore the problem. As clearly stated by a businessman in an interview some years ago "We are a profit-oriented company and if that means destroying the environment within the legal limits, then we will do it."' (MacAndrews: 379) Non-use of pollution prevention capacity also occurs: 'In another case, the Environmental Impact Control Agency, checking on untreated waste being dumped in the Cidurian River in west Java, found that while the company had built a sophisticated waste water treatment capacity, it was only used during the day and most of the untreated waste was disposed directly into the river at night. Similar cases are frequently reported in both English and Indonesian-language newspapers.' (MacAndrews: 380)

The failure of environmental regulation

In June 1989 water pollution standards were issued. Despite this raft of laws, environmentalists have criticised the government for failing to prosecute polluters. In response to these charges, in 1990 the government set up an environmental protection agency, Bapedal, which reports directly to the President. Bapedal has been given wide-ranging enforcement powers, especially regarding pollution control, toxic waste and EIAs. Regulation proved ineffectual at best. In June 1991 the Environment Minister said 500 firms, spread over eleven of Indonesia's twenty-seven provinces, had failed to comply with water effluent standards set in 1989. (*EnvDig* 48: 12) The pollution continues. (*BsWk* 9/9/96: 25)

Still, environmental crisis stalks Indonesia, threatening economic development itself, (Hardjono) and while some attempts have been made to reduce pollution, not all have been in earnest, or successful. 'Indonesia has tended to act only when the weight of evidence against polluters is substantial.' (Cribb: 1130) In 1977 the east Java provincial government decided to reduce pollution in the Surabaya river by refusing further construction permits for factories along its banks and formally tightening pollution controls on existing factories: these new controls were apparently not enforced, however. (Cribb: 1129)

A cynical view of the limitations of government environmental regulation in Indonesia is presented by local environmentalist, Indro Tjahjono: 'Some other factors have successfully contributed to making the regula-

tory system a complete comedy: the tiny budget allocated for it, the chronic shortage of staff, the lack of modern supports such as a satellite camera, wicked personnel and barely any law enforcement.' (Tjahjono: 19) Here again the corruption issue arises: 'One [chemical] plant manager says it is normal practice to pay off Indonesian government officials in charge of enforcing environmental standards because compliance procedures are cumbersome and time-consuming.' (*CEN* 11/8/97)

A more measured review by an academic observer illustrates the magnitude of the internal bureaucratic tasks Bapedal faces before it even starts regulating pollution. 'In terms of staffing and training, the agency faces a daunting task. Apart from the general problem of attracting experienced and able staff, there is also the sheer number of positions that will eventually have to be filled. In addition to recruitment to the central Bapedal, which will certainly expand in size, an estimated 863 staff will be needed once the regional Bapedal offices are set up in the first eleven provinces, and up to 1,200 more when the network of regional offices is expanded nationwide. In all cases, both professional and technical training will be required for incoming staff, few of whom will have adequate education or experience for their positions.' (MacAndrews: 99-100)

Major problems also confront Bapedal due to 'its lack of enforcement powers. As late as 1993 there was still some uncertainty as to what would finally emerge as Bapedal's mandate for enforcement ... Yet Bapedal still has no power to inspect pollution sources ... It is estimated that no less than ten substantive and thirteen procedural laws will have to be enacted if Bapedal is to have adequate enforcement authority.' (MacAndrews: 100-101)

This is, of course, a general problem with Indonesia's environmental legislation. While sweeping legislation has been enacted, enabling regulations often fail to follow, thus undermining the effectiveness of the legislation as anything but a showcase: 'One of Indonesia's main environmental laws is the 1982 Environmental Management Act, which lays down a set of comprehensive principles but has not yet been followed up by the necessary implementing regulations.' (MacAndrews: 37)

Despite the above enforcement problems, the state is continuing to initiate legislation and was reported as intending to impose environmental standards similar to those in the Netherlands by 1997. (*BsAs* 15/8/94: 7) Whether it will actually enforce these standards is another question.

Toxic waste

In 1982 when the Environment Management Act was introduced, some ten locations were chosen as hazardous waste management sites, but to date there is no commercial hazardous waste disposal facility in operation. Some of the larger waste generators have their own waste disposal systems in place but, in general, hazardous waste in Indonesia is reported to be 'unlikely to be treated to modern environmental standards'. The Ministry of State for Population and the Environment admits solid waste is often illegally dumped. (*HazNews* Mar 93: 1; Oct92: 16) One such case occurred when residents sought hospital treatment when waste was dumped by P T Indiah Kiat on marshland in west Java in November 1993. (*DTE* 22: 10)

In May 1994 Indonesia passed a law requiring companies to dispose of toxic waste properly and also banning the import of toxic and hazardous waste. (*BsAs* 15/8/94: 7) Bapedal has also been involved in responding to the demands for toxic waste facilities. (MacAndrews: 98) Whether it gets any farther with these plans than it has with its other plans remains to be seen.

Indonesia has been named as a target of the international waste trade. Between 1990 and 1993, Indonesia imported 21 tonnes of ash and residues, 124 tonnes of ferrous waste, 14,776 tonnes of metal waste, and 7,327 tonnes of plastic waste. (Greenpeace: 5) From January to November 1991, according to Greenpeace Washington, 14.7 million kilos of plastic waste were shipped to Indonesia supposedly for recycling and reclamation. (*DTE* 17: 14, June 1992) In November 1992 the Indonesian government announced a ban on the import of plastic scrap into the country after Bapedal found that only 60% of the plastic waste imported into Indonesia could be recycled.

The Indonesian Minister for the Environment in March 1993 said. 'We do not want to turn Indonesia into a waste dump. We will only recycle Indonesia's waste.' Earlier, in January, the deputy chairperson of Bapedal had said companies which import toxic waste would be prosecuted for smuggling, while adding that toxic waste now in transportation or ready to be shipped to Indonesia would be rerouted to Vietnam.

The ban does not seem to have been particularly effective. By February 1994, when the MV Greenpeace docked in Tanjing Priok in Djakarta as part of Greenpeace's anti-toxic waste trade campaign, according to WALHI (the Indonesian Environmental Forum), there were

still eighteen containers of imported waste and fourteen of hazardous waste in Tanjing Priok, awaiting return to their country of origin. (*DTE* 23: 12)

Environmental movement

Indonesia has seen the same outbreaks of popular opposition to the chemical industry as other Asian countries. In 1980 local farmers in Banjaran, near Djakarta, burned down a state-owned chemical factory they accused of polluting their irrigation channels for the previous three years. (Hardjono: 13-14) In November 1993, following a chlorine gas leak from the PT IIU pulp and paper plant in Porsea, 2,000 residents demonstrated at the factory, then attacked it, causing damage to property estimated at $2.4 million. (*DTE* 22: 7)

In November 1995, thousands of fish farmers attacked the P T Cheil Samsung Indonesia monosodium glutamate factory in Pasuran, east Java, which they accused of polluting fish and shrimp ponds and thus endangering their livelihood. Protesters, fed up by the failure of action through official channels to effect any change in the factory – which holds a certificate under the Clean Rivers programme – blocked the factory's waste outlet into the Rejoso river. Protests at the factory developed into a riot that lasted five days in which factory vehicles and fourteen buildings were damaged. Troops called in to deal with the riots arrested sixty-three people: students and other 'third parties' were blamed for the violence. (*DTE* 28: 4)

One multinational plant manager said in 1997, 'If a plant is found to be polluting its surroundings, the farmers, fishermen or tribesmen living nearby get furious and quickly launch an assault on the plant carrying spears or traditional weapons. So you know immediately when you have a problem.' (*CEN* 11/8/97)

In the 1980s there was a dramatic growth in non-governmental organisations (NGOs) in Indonesia. These NGOs have no mass base and are tightly regulated by the state. Some new environmental NGOs have been prepared to use litigation against polluters, albeit not terribly successfully. The growth of these groups has led to the foundation of WALHI, the Indonesian Environmental Forum, at the first national meeting of Indonesian NGOs in May 1980. The success of WALHI can be seen from the growth in the number of NGOs it services – seventy-nine NGOs in 1980 to over 400 NGOs in 1987. The size of these NGOs varies from two to three person operations to NGOs with staff of over 200. (Wickham:

2) WALHI, like other Indonesian NGOs, is in a restricted position due to state regulation: 'To merely survive as an organisation requires a considerable amount of finesse and, at times, restraint and compromise.' (Wickham: 4)

After the Asian Financial Crisis

The AFC struck deepest and longest in Indonesia, bringing an end to Suharto's reign and eventually leading to his being charged with corruption in May 2000. The continuing unrest and uncertain political settlement has led to MNCs halting or delaying FDI projects. But, despite the lack of stability and profitability, Indonesia is still too tempting to be abandoned by MNCs: 'Despite the difficulties in doing business in Indonesia, oil, mines, timber and agricultural products combine to make it a highly attractive country.' (*CEN* 9/4/01: 14)

Here also the expected transfer of assets to MNCs has not occurred, either through nationalism or inflated price expectations on the part of the local elite. An early example came in January 1998 when Dow met Bambang to discuss buying a stake in Chandra Asri. While Bambang needed the cash, he was not prepared to cede control. One Dow executive asked an adviser, 'Are these guys aware that they are staring into the abyss?' (*FEER* 13/5/99: 10) Provincial factors are also affecting sales. Mexican company Cemix bought 25% of Semen Gresik in 1998 but has been blocked from exercising its option to buy 51% as two provincial administrations – citing the recent Regional Autonomy Act – are claiming ownership of Semen Greisik plants. (*CEN* 19/11/01: 39)

After the repression of the New Order period, the reform period resulted in a flowering of different interests, demands and voices: 'Militant Islam, populist xenophobia, neoliberal utopianism, Christian apologetics, and human rights activism have all grown markedly in volume, visibility to bring on mass rallies, mobs and marching in the streets.' (*NYRB*) Nor should one forget the political as well as economic nationalism of the military, as well as the resurgent nationalism of Irian Jaya and Aceh, both of which could follow the East Timor example and leave the Indonesian empire. This growth in activism is felt everywhere: 'Another challenge that foreign companies have been facing in Indonesia is a rise in civilian militancy.' (*CEN* 9/4/01: 14)

Some indication of the increased militancy can be seen in recent troubles affecting Caltex in Riau. In November 2000, villagers demanding compensation set fire to four oil wells in the Batang oil field. Late in

January 2001, villagers occupied the Kerang oil field in Rokan, stopping production on 8 February. The occupation was ended in late February after 'pressure' from the security forces. In March villagers from Air Jemban took over an oil rig in the Duri field demanding compensation. The next month it was the turn of the Bongko oil field, where hundreds of villagers occupied a rig, having previously blockaded the area for a month. (*DTE* 49, May 2001)

On 25 September, 2000, some 300 local people began a blockade of the Unocal Tanjungsantan terminal calling for compensation and an end to pollution. The blockade was broken by police on 8 October, with seven protestors suffering bullet wounds and another sixteen being seriously injured. (*DTE* 47: Nov 2000)

In Aceh, ExxonMobil shut down its operations for four months and only restarted on a day-by-day basis in July 2001 due to difficulties running its operations in the midst of a regional struggle for autonomy, having had little difficulty previously when 'Aceh endured a brutal campaign by Indonesian forces throughout much of the 1990s.' (*WSJE* 7/9/00: 8) A suit filed in June 2001 accused the company of providing logistical and material support for Indonesian troops in the campaign. Pertamina denied ExxonMobil bore any responsibility, dismissing them as a sub-contractor: 'It is Pertamina's responsibility, so feel free to file a lawsuit.' (*Guard* 23/6/01: 12) During the early 1990s the field produced nearly a quarter of Mobil's global revenue but by 2001 it represented only 2.5% of ExxonMobil's global income. (*FEER* 16/8/01: 24-25; *WSJE* 7/9/00: 1,8)

Notes

(1) On women workers see also Horton, pp.81-133; Ward, pp.25-47; *AMPO* 22(1): 22-25; Grijns, M *Different women, different work*, Avebury; Wolf, D L (1992) *Factory daughter*, University of California Pr

(2) On petrochemical development see *ECN* 4/10/93:20-21: *FEER* 30/3/89:52-56; 7/11/91:56-58; 7/1/93:50-5

10

China
The last great hope

One major stimulus to East Asian growth in recent years has been China, where economic growth was 12% in 1992, and where the economy was expected to grow 8-9% annually until the end of the decade. (*FT* 24/3/93: 32) The value of China's exports has increased from 21 billion yuan in 1979 to 389 billion yuan in 1991. (Smith: 61) A study by the Australian National University in 1995 predicted that China would be the world's second largest economy in the year 2005 and in the top half-dozen trading economies. It also forecasts that the PRC will dominate labour-intensive commodity production, with production gradually shifting inland, with the south east coast moving up into high-value production. (*FT* 2/6/95: 5) According to Bruce E Moore of Eastman Chemical, China will be the place of hottest growth 'for the next 100 years. The magnitude of the growth challenge that China represents (is) almost inconceivable to senior corporate planners.' (*CMR* 18/9/95: 31) From a critical perspective, 'In China, as in Russia, we are witnessing today what amounts to the greatest enclosure movement in history – virtually a continent-wide expropriation of social property far surpassing in scale the enclosure movements of England and Europe of centuries past.' (Smith: 12)

The transformation since 1989 has been breathtaking. State-owned enterprises (SOEs), which then accounted for two-thirds of economic

output, are now responsible for just 28%. 'The once-minuscule private sector, which the government only endorsed three years ago, now accounts for one-third of output and is the main driver of job growth.' (*BsWk* 16/4/01: 40) Under the direction of the CCP (Chinese Communist Party), mandarins turned merchants, the PRC created a companies' law during the 1990s, and entered the WTO in December 2001. According to an analyst with ING Barings, the PRC could be on the way to becoming 'the world's cheapest producer of everything'. (*WSJE* 5/3/02: M11)

The PRC's opening to the global economy began in 1979 when it created enclaves known as Special Economic Zones (SEZs) on the southern coast as a locus for FDI. In 1984, fourteen coastal cities were opened for FDI, and in 1985 three river deltas, comprising over 100 million people, were opened. 'By 1991 foreign trade surpassed $134 billion, with an annual growth rate in 1985-1991 of 17.5%. Committed foreign investment was $47.9 billion. China's "open-door" policy involved a shift to an export-led strategy, combined with vestiges of an import substitution industrialisation regime.' (Zweig: 256)

The motor of growth in China's economy is the foreign investment sector, mainly concentrated in South China, particularly in Guangdong. 'Considered on its own, Guangdong province is far and away the fastest growing economy in the world. Guangdong's industrial output climbed by nearly 20% per year from 1980 to 1990, and 27% in 1991. Guangdong is now China's leading industrial producer, and it also leads the nation in foreign investment, retail sales and exports.' (Smith: 90) Out of some $20 billion FDI that entered China from 1979 to 1991, 40% has gone to Guangdong. 'Foreign investors poured $3.5 billion in FDI into China in 1991 and $11 billion in 1992, making China the largest recipient of foreign investment in the world.' (Smith: 94)

By 1995 existing FDI commitments were more than $390 billion and actual investment was more than $135 billion. (*FT* 27/6/96: Supp4) The results of this FDI are formidable: 'There are now 150 million people in south-east China alone working in manufacturing, far more than in all of the EU put together or the US.' (*Guard* 28/9/96: 5) Much of that capital has come from other Asian countries, as first Hong Kong SMEs moved across the border into Shenzen and then Taiwanese companies crossed the strait to the mainland. By 1993 over $7 billion of Taiwanese capital had been invested in the PRC. (*FT* 21/5/93: 5) In the first half of

1995 Taiwanese companies pledged $30 billion for 30,000 investment projects in mainland China. (*CMR* 11/9/95: 27)

Unaffected by the AFC due to its isolation from the global economy, the ascension of the PRC represents a major threat to the SEA economies in particular, as the PRC now sucks in most FDI heading for Asia: 'More than $112.3 billion during the past three years and another $86 billion expected in the next two.' (*Fortune* 4/3/02: 60) In 2001 the PRC 'absorbed more FDI than South Korea, Thailand, Malaysia, Singapore, Vietnam and Indonesia combined.' (*Fortune* 4/3/02: 61) Much of that FDI is now coming from Japan and, revealingly, not just the low-end products that were moved to SEA in the late 1980s. 'Now Japan's electronics makers are throwing everything but the crown jewels into China ... Pioneer, for example, recently set up a factory in Guangzhou for its most sophisticated DVD recorders, just a few months after the technology had started production in Japan ... [Its president said], "In the past I couldn't have imagined transferring output of Pioneer's strategic products overseas only five months after launching domestic production."' (*Fortune* 4/3/02: 61-62)

China is also attempting to develop both local companies and joint ventures into companies that can compete globally: 'The resurgent State Planning Commission in Beijing is focussing on bringing five "pillar industries" – autos, electronics, petrochemicals, machinery and building materials – into the twenty-first century. The goal is to guide foreign joint ventures and get local players to merge into big groups like Korea's *chaebol*.' (*BsWk* 4/3/96: 18)

To do this means dealing with the legacy of decades of state socialist industrialisation, the massively wasteful SOEs, and removing from them their social commitments, the housing and education activities that constituted the Chinese worker's 'iron rice bowl'. Smashing that iron rice bowl is necessary for the success of the capitalist project in China: privatisation is one means towards it. One 'successful' example of this is reported by *Time* (10/5/93: 69): 'Last June the government approved the sale of the first such firm to a foreign investor when Wuhan No.2 Printing and Dyeing Works was sold to Hongtex Development, a Hong Kong company. Though the firm had lost $5 million a year, the new owners quickly turned the business around, mainly by laying off 1,146 of 1,920 workers. Several hundred of the dismissed employees were given jobs in guest houses or shops affiliated with the new owners, but others were put

on short-term contracts.' A more recent example involves a $240 million acetic acid plant involving a 51:49 joint venture between *BP* and Sinopec Sichuan Vinylon in Changshou Province in China's western hinterland. The factory 'is still a very Chinese-style work unit, providing schools, medical care and housing for its workers. The acetic acid plant, 51% owned by *BP*, will be ring-fenced from these welfare commitments.' (*Indep* 27/10/96: 5)

If the lunacy of state socialist development is being left behind, it is simply being replaced by a new economic lunacy. 'The transition to capitalism is installing an entirely new economic logic – but one that is hardly less brutal or artificial than the communist bureaucratic system it is displacing. The brutalities, artificialities and irrationalities of the market system are just different. Capitalism is replacing the irrationalities, waste and inefficiencies of the bureaucratic system with the irrationalities, waste and inefficiencies of the capitalist system: Mao's "poor but equal" socialism in poverty is being replaced by a society of massive social inequality, of vast ill-gotten wealth alongside deepening poverty.'[1] (Smith: 13)

That this transition is taking place under a strong state is normal for EA: that it is being guided by an increasingly politically and morally bankrupt CCP gives occasion for delicious irony (such as Deng's formulation: 'SEZs are socialist, not capitalist'); that the same bureaucracy is now a kleptocracy is cause for anger. The new generation of capitalists are involved in 'wholesale plunder of state and social property: embezzlement of state monies and foreign exchange, bribery, kick-backs, graft, profiteering on resale of state goods, currency manipulations, influence peddling, illegal privatisation of state-owned firms and properties, expropriation of workers' and peasants' housing and land.' (Smith: 11) Corruption levels in the PRC are similar to those in Indonesia: 'CP membership has become the equivalent of a gigantic ATM.' (Smith: 12) As Henderson notes, 'Political-economic corruption (particularly at local and provincial levels) seems to have reached its historical zenith in China.' (Henderson: 363)

MNCs have found that the PRC strikes a hard bargain. 'By masterfully leveraging access to its market, Beijing is getting multinationals to subsidise large research and development institutions, modernize university curriculums and promise to use China as an export base ... the price of entry (for western corporations) is mainly on Chinese terms and as they offer up their technology secrets, anxiety is growing.' (*BsWk* 4/3/96: 15-16) The basis of these hard deals lies in control of access to the

Chinese market: China is so big it makes its own rules. This tendency, together with China's protectionism and political otherness, is again beginning to worry capital's representatives. 'The thought of such a colossal, unregulated and unruly object hurtling through the global economy makes analysts shudder. "China's sheer size means the rest of the world has to take developments there very seriously," says Marcus Noland of Washington's Institute of International Economics. "It is the single biggest potential threat to the world trade system."' (*BsWk* 4/3/96: 16) Nationalist sabre-rattling by the elite that rules the PRC – in place of the socialist ideology that it has abandoned – also threatens to upset the applecart of East Asian, and world, economic prosperity.

Of course, the other threat posed to the PRC economic miracle comes from its hard-suffering populace. The contradiction between the Chinese regime's ideology and the political economy it practices, the widening corruption and stratification, combined with huge unemployment, massive migration of peasants to urban areas, deep disparities of wealth both individually and regionally, threaten not only the orderly capitalist development of the economy but also the local bureaucratic authoritarian industrialising regime, the CCP.

The PRC's attractions: cheap labour, pollution havens

The PRC's attractions are spelt out in a recent *Business Week* article: 'It has an abundant pool of young, high-school educated workers earning about $1.50 a day, with millions more entering the workforce each year.'

Among the major attractions China offers international capital are child and convict labour,[2] as well as female migrant labour, ready to play its part in the burning factories syndrome. The conditions of migrant female labourers in the SEZs are similar to those we have already encountered in other countries.[3]

The ICFTU reports on the working conditions in Guangdong: 'Nearly all of these migrant workers, mostly young rural women from the poorer provinces such as Hunan and Sichuan, are employed under short-term contracts. There are few rights and little welfare offered to the workers in these sweatshops. Knowing that most of the migrant workers are ill-informed, compliant and unprotected, the "mingong" are treated like slave labour. Workers live in overcrowded dormitories and eat meagre meals. Seven days a week and fourteen hours of work per day is the norm. The factory management often retains people's wages. Horror stories

abound, such as women workers not being allowed to go to the toilet and subject to body searches. Disobedient workers are frequently beaten by managers, sometimes with electric batons. Workers are often locked in at night in crowded and bare dormitories. Health and safety protection is practically non-existent.' (ICFTU: 33)

An example of this exploitation can be found in Smith's description of the situation in Shenzen with Kader Enterprises Ltd, a Hong Kong company previously seen playing its part in the burning factories syndrome in Thailand:

'No less an authority than *Business Week* reports that the 12,000 workers of a Shenzen assembly operation of Kader Enterprises Ltd, Hong Kong's largest toy-maker, typically work 16-hour days – often seven days a week – for wages of around US$21 a month. Most of these employees are women from seventeen to twenty-five years of age, but many are just children, some as young as twelve years old. They sleep six to a room in company dormitories. Says a Kader executive, "We can work these girls all day and all night, while in Hong Kong it would be impossible. We couldn't get this kind of labour, even if we were willing to meet Hong Kong wage levels."'

Kader's US customers, among them Tonka, Mattel, Disney, Hasbro and others profess (naturally) that they 'don't have much say' about Kader's business. And Kader, *Business Week* adds, 'provides comparatively good pay and conditions.' (*BsWk*: 31/10/88: 46-47)

Chinese investigators found that, in 40 out of 200 businesses investigated in Shenzen, girls as young as ten and twelve years old were employed, who worked 15-hour days for $10 a week and slept in dormitories two or three to a bed. Still, when Chinese labour union officials asked Kader to reduce its compulsory overtime, Kader's Hong Kong manager, one Andy Lee, stated flatly, 'We told them, this is toy biz. If you don't allow us to do things our way, we'll close down our factories and move to Thailand.' (Smith: 95)

Nor are these conditions confined to sub-contractors. *The Wall Street Journal Europe* reported on conditions for a teenage female migrant worker at a Mattel Barbie doll plant in Changan, Guangdong. 'She and eleven other women live crammed into a narrow room with a concrete floor, a fluorescent bulb and a bathroom barely big enough to turn around in. Cold water sputters on for a couple of hours twice a day, while the meat served in the canteen is too tough to swallow and has hair in it. The pay,

it turns out, is paltry, only 200 yuan a month, or about $24, during the first three months, with eventual earnings rising to 400 yuan a month.' (*WSJE* 30/10/96: 5)

Smith also claims that the PRC is presenting itself as an offshore pollution haven for Taiwanese and Hong Kong industry. 'China's model reformers are also selling China to multinational capital as a location for polluting industries and toxic dumps. In Taiwan, after big public protests and studies indicating that the health and even the intelligence levels of children were threatened, a 1989 blue-ribbon panel warned that the island was at risk of becoming a "poisonous garbage dump" because of horrendous air, water and soil pollution, especially from multinationals, including lead smelters, toxic waste recyclers and similar industries that had set up in Taiwan to escape environmental controls in the US and Japan. Under pressure to relocate again, some have turned to the PRC.' (Smith: 96)

One Joe Cheng told Bill Myers of the Centre for Investigative Reporting, 'Yes, a lot of people try to find a place to get rid of their stuff. And I think the best place right now is China ... Right now I get the feeling the government only cares about the money. I don't think they realise the problem yet.' (Smith: 96)

The *Financial Times* confirmed that this was one cause of Taiwanese investment. 'Despite the ban on all investment in China, over the last four years thousands of companies have shifted their operations there to escape rising land and labour costs and environmental protests.' (*FT* 10/4/91: 4)

The cheapness of Chinese labour and its growing economy are therefore not the only lures for other Asian investors. 'You cannot rule out that Hong Kong and Taiwan factories move into China just to escape environmental and safety regulations, to try to enjoy a bit of liberty,' Yip Yuk-lun, executive director of Hong Kong's Occupational Safety and Health Council, told the *Far Eastern Economic Review*. (19/8/93: 54)

Finally we need to emphasise that this exploitation is not only in foreign-owned factories. Some of the greatest exploitation is found in the *laogai* or forced-labour camps. 'Laogai prisoners produce stuffed animals, tools, textiles, rubber boots, plastic flowers, asbestos and tea. LRF (Laogai Research Foundation) estimates that approximately 1000 Chinese forced-labour camps hold ten million prisoners.' (*MM* Oct95: 25) Harry Wu described conditions in the Beiyuan Chemical Factory in

Devaituchang, where he was imprisoned during the 1960s as follows: 'There was no worker protection. I still have a scar on my left leg due to chemicals. Prisoners' eyes and lungs were damaged due to chemicals. Every day I saw inmates get burned.' Wu claims conditions have not changed. 'There is no doubt that they are extremely hazardous. Often labour camps produce goods that other factories don't want to because they are dangerous.' (*MM* Oct95: 25)

Development of the petrochemical sector

Chemicals production in China is booming along with the economy,[4] and major growth is expected in chemical production in the PRC in coming years. Ethylene production, 1.8 m metric tonnes in 1990, was expected to soar to 3.7 m in 1995, while man-made fibres, 1.5 m metric tonnes in 1990, reached 2 m in 1995 and were expected to reach 2.6 m in 2000.

State support for the petrochemical industry only took off in the 1980s. Government policy continues to target petrochemicals as a key area: 'Petrochemicals are seen as the mainstay of China's national economy and paramount importance has been attached to the development of this industry over the past four decades.' (*ECN* Feb 93: 30) The PRC has supported further petrochemical development as import substitution. As one example, due to the rapid growth of its clothing industry, PRC imports of chemical fibres and raw materials for synthetic fibres rose from $183 m in 1975 to $3.73 billion in 1995. (*FT* 15/3/02: SuppIV)

In 1983 the China Petrochemical Corporation (Sinopec) was established by the government to help in the restructuring of the industry. By 1993 Sinopec was the largest industrial group in China. (*ECN* Feb 93: 30) The Chinese chemical industry is dominated by Sinopec, which controls over seventy subsidiaries, operating thirty-eight refineries, twenty-one other petrochemical facilities and numerous downstream operations. Since 1983 Sinopec has brought on line four 300,000 tpa ethylene plants, with others under construction. Plans in 1993 were for ethylene production capacity to reach 2.5 million tonnes by 1995 and 3 million tonnes by 2000: this involves construction of eight ethylene plants, three aromatics plants and seven other major chemical projects during the 1990s. (*CMR* 7/6/93; *FEER* 29/7/93: 50-51) Sinopec's 1995 production included 5.5 million tonnes of fertilizer urea, 2.1 million tonnes of ethylene and 1.3 million tonnes of chemical fibres. (*CMR* 1/1/96: 22)

Liu reported in 1993: 'There are about 6,000 or more chemical enterprises in China producing more than 38,000 kinds of chemicals with an output value of some 8% of the industrial GNP, [while its] production of synthetic ammonia, chemical fertilisers, pesticides, sulphuric acid, soda ash and dyestuffs, is in the top three places in the world.' (Liu: 276) Much of the industry, resulting from previous HCI pushes, is well below world-scale, decrepit, suffering from low productivity, encumbered with large workforces and social obligations and ecologically poisonous.

China announced plans to double petrochemical output by the year 2000 from its $4.6 billion level in 1990. (*CMR* 29/3/93: SR14)

The Chinese chemicals market was valued at $58 billion in 1991. In 1994 demand for chemicals in China was estimated to be growing at 9% per year. In the first nine months of 1994, Chinese chemicals sales rose 22% to $18 billion, according to the Ministry of the Chemical Industry. The provinces with the largest share of chemical production were Shandong, Jiangsiu and Liaoning. (*CMR* 31/10/94: 22)

By the end of 1991 official government figures estimated Chinese ethylene production at 1.76 million tpa, making China the eighth largest ethylene producer in the world. The government target is to reach 3 million tpa by 2000: to ensure the target was met some 14 units were under construction in early 1993. The eighth Five-Year Plan targets require construction of 'eight new naphtha crackers, three synthetic fibre plants, three refinery cat crackers and four polymer facilities'. (*ECN* 12/7/93: 14) In January 1994 Chem Systems estimated that Chinese ethylene capacity was 2,284,000 tpa, with currently operating plants planning capacity expansions of 730,000 tpa. Plans for new grassroots ethylene projects up to 1995 total 2,785,000 tonnes. (*CMR* 31/1/94: 18) Yu Kang Zhuang, of Nanjing Chemical, estimated plastics output would exceed 5 million tpa in 1995 and reach 7 million tpa in 2000, with average per head consumption rising from 3 kg/yr to 4.5 kg/yr and 6 kg/yr. (*ECN* 12/7/93: 16)

For the chemical industry sectors, the PRC intends raising fertiliser production from 114 million tonnes in 1995 to 170 million tonnes by 2000. (*CMR* 1/1/96: 22) In 1991 there were around 1100 pharmaceutical plants, mainly producing bulk pharmaceuticals, with a turnover of 24.8 billion yuan ($5 billion). (*FT* 19/5/93: 35) The Chinese agricultural chemicals market is relatively small, worth some $643 million in 1991, 30% of which was imported. The Chinese pesticides industry has capac-

ity for some 120,000 tpa of active ingredients, but two-thirds of this capacity is for organophosphorous compounds and the industry has been described as representing 'a growing economic and ecological problem rather than a long-term asset'. There are some forty main local producers. (*AsiaFAB* Sep92: 11) China is set to become the world's largest market for paints and coatings: 'In the year 2000, at a conservative growth rate of 7.5%/year, the market size will be over 1.5 million tonne/year.' (*ECN* 12/7/93: 16)

In the late 1990s the PRC deregulated and restructured its petrochemical industry again. The Ministry of Chemical Industry (MCI) was abolished in 1999, while Sinopec and China National Petroleum Corp (CNPC) were restructured. MCI transferred plants it controlled directly to Sinopec and CNPC, giving others to local governments. Sinopec got all oil and petrochemical assets east of Shaanxi from Beijing to Guangdong, while CNPC got those in the rest of the PRC. CNPC has 1.5 million workers and Sinopec 1.19 million. (*CEN* 9/3/99: 13)

The new Sinopec has been transformed from 'a communist-era monolith [which] boasted more than 1.3 million workers, a large number of inefficient plants and enough welfare services to run a small state, including five universities and colleges, 400 schools and 400 hospitals.' (*FT* 3/10/00: 31) It intended continuing its transformation. For 2001, its plans were to drop 27,000 workers and cut a total of 100,000 jobs by 2005. (*CEN* 15/1/01: 11) Sinopec is also planning to go green by introducing a health, safety and environmental management system which it is partly modelling on *BP* Amoco. The source of pressure here is significant: 'Sinopec has noted the beating that oil companies' share prices regularly take on world markets following any accident. "Western green groups will always demand more, companies that fail to be proactive may find their existence threatened", a Sinopec official said.' (*FEER* 5/7/01: 34). Globally, Sinopec was listed as the twenty-fifth largest chemical company, with sales in 2000 of $6,791.6 m and profits of $294.4 m. (*CEN* 23/7/01)

The multinationals move in

Just as the PRC has been presented as a bonanza for international capital, so has it been hyped specifically in relation to the chemical industry: 'China ... has been described as a last frontier for Western chemical companies looking to expand business worldwide.' (*ECN* 12/7/93: 14) DeWitt's Rick Cole said in 1998 that the PRC is key to future growth

in the Pacific Rim, holding 14.4% of world trade in PE, 21.7% in PP and 18.3% of all polymers. (*CMR* 6/4/98) Another example of this Chinese boosterism is given by Stephen Liu, managing director of Zeneca China: 'The momentum of the second economic tide puts China on a path to becoming equal to the US in ten years and the world's largest economy in the next twenty years.' (*ECN* 12/7/93: 14). For those not up on the poetics of Chinese economic development, the second economic tide involves greater opening of interior China to foreign capital.

One example of China making the road smooth for foreign multinationals is shown by Haicang, near Xiamen City, where £578 million is being invested in infrastructure and other developments for what is being called China's 'ethylene city', where plans include deep-water berths to import oil and factories to allow downstream development of plastics and chemicals. The plan was spurred by Formosa Plastics' announcement of plans to build a naphtha cracker there. It was assumed much of the downstream plastic industry from Taiwan would follow. But Formosa Plastics' plans were blocked by the Taiwan government. Local officials say foreign companies will come when the infrastructure is ready: 'Haicang is an objective necessity. It will continue with or without foreign investors.' (*FT* 4/11/92: 8)

The MNCs are pouring in. Their importance is most easily illustrated in the case of the six integrated complexes currently being negotiated, all of which feature a large MNC holding 50% of the project. (*CEN* 12/6/00: 25) In March 2000 *BP* Amoco announced plans to spend up to $1 billion to buy 20% of PetroChina's initial public offering, while also planning to invest $1 billion in joint ventures with PetroChina. (*WSJE* 24/3/00: 1) In August 2000 Shell was reported to be planning investing $1 billion buying equity in Sinopec and the Chinese National Overseas Oil Corporation (CNOOC). (*Guard* 22/8/00: 27)

The speed of approval now is startling. BASF's $2.6 billion joint venture with Yangzi Petrochemical for its Nanjing complex was 'approved in June by Chinese PM Zhu Rongji only a few weeks after submission of the feasibility study.' (*CEN* 21/8/00) Compare this with the ten years Shell spent negotiating its Nanhai project. (*ECN* 2/3/98: 20)

Other multinational involvement is growing. In October 1993 Amoco Corporation and Sinopec signed a two-year agreement to explore possible projects, including refining and petrochemical operations. (*CMR* 4/10/93: 5) Other US MNCs, such as Du Pont, Eastman and

Monsanto are pouring into the PRC. Max Lee, Monsanto's new director for Greater China said, 'Monsanto has up to now put more emphasis on North America and western Europe, but we are now stepping up operations in the Far East, with an emphasis on China ... We intend to have a meaningful presence, including equity joint ventures and marketing and technical alliances.' (*ECN* 7/3/94: 25)

For European MNCs, there has been a rash of new project announcements. Bayer agreed in 1993 to invest $200 million over the next several years, signing agreements with six different Chinese companies. (*CMR* 6/12/93: 9) In February 1994 Hoechst announced plans to invest $200-300 million in joint ventures in the PRC in 1994-1995. (*ECN* 28/2/94: 31) Swiss pharmaceuticals and chemicals group Ciba is also heavily involved in China, with twenty projects in the country and plans for a further seven joint ventures. (*FT* 26/10/93: 7)

Much investment is coming from Asian petrochemical companies. FPG subsidiary Nan Ya Plastics announced plans to invest $34 million in PVC pipe plants in Shandong, Anhui and Fujian. Nan Ya hopes to eventually open forty PVC product plants in the PRC. (*CMR* 10/1/94: 7) There are also major plans by Korean chemical companies to invest in the PRC. Samsung Group plans to invest $200 million in chemical manufacturing projects in the PRC by the year 2000 (*ACN* 26/6/95: 20) while Yukong, the petrochemical arm of the Sunkyong group, plans to invest $9.2 billion in the Chinese oil, petrochemical and chemical industries over the next ten years. (*ACN* 12/6/95: 26)

Another form of joint venture involves R&D contracts. In 1994 Rohm and Haas announced collaboration on agrochemicals R&D with the Shenyang Research Institute. In 1995 Pfizer announced cooperative plans to study traditional Chinese herbs, while Bayer is involved in joint R&D on plant breeding and protection. (*CMR* 25/7/94: 8; 16/1/95: 17; 30/1/95: 22)

Environmental crisis

China's policy of growth presages an environmental crisis that will add to the already existing problems caused by previous state-sponsored industrialisation: 'China's apparent current prosperity, built on a foundation of decades of ideological simple-mindedness and ecologically disastrous agricultural and industrial practices, is inherently fragile, and faced with a host of interlocking challenges that are apparently insuperable. "There are no solutions," as Smil (1993) puts it, "within China's eco-

nomic, technical and manpower reach that could halt and reverse these degenerative trends – not only during the 1990s but also during the first decade of the new century.'" (*NYRB* 23/3/93: 15; review of Smil 1993)

Of course the economic reforms 'have produced contradictory effects on the control of environmental pollution. Enterprise managers can be held responsible, yet their search for profits (and competition with rivals) reduces the desire to spend on controlling emissions.' (Glaeser: 258-259) Notes Glaeser: 'Most polluted waters are concentrated in and around cities. Polluting industries tend to be relocated in rural areas, where the toxic waste waters they emit are frequently channeled into irrigation systems.' (Glaeser: 256). This of course leads to conflict with local farmers.

Smil notes that rural water pollution problems are due not only to the relocation of polluting industries from urban centres, but also to the setting up during the 1980s of town and village enterprises (TVEs): 'Rural water pollution has been greatly increased by the huge expansion of local industrial enterprises absorbing the surplus peasant labour during the 1980s, and operating without any pollution controls.' (Smil 1992: 433) Nor is this pollution only of water. A World Bank study, Urban Environmental Pollution, found in 1994 that 'the percentage of pollution caused by emerging rural manufacturers has risen significantly since 1985 – for instance, their contribution to air pollution has risen from 20% to 35% of the total Chinese air pollution.' (*EnvDig* 88: 11, Oct94)

Following the pattern first established in Japan, water pollution is having its effects on primary food producing industries. Annual breeding of the four main fish in the Yangtze river has fallen from 20 billion in the 1970s to 1 billion at present, according to China's national EPA, while a World Bank study reports that about 1.4 million hectares of cropland are irrigated by contaminated water, leading to heavy metal pollution of crops. (*FT* 18/11/93: Supp X) Smil reports that, 'Other forms of soil contamination, affecting almost seven million hectares of cultivated land by 1990, involved excessive pollution from industrial water, wastes, mine tailings and pesticides.' (Smil 1992: 434) Rural industrialisation since the 1980s has poisoned ten million hectares of farmland, resulting in animal and crop losses of $2.7 billion. (Smith: 20)

This is only the most recent expression of a long-term problem. Since 1950 the decline in the total area of cropland in PRC is estimated at 20%, as much as all the farmland in Germany, France, England, Scot-

land and Wales. 'The cumulative loss of about forty million hectares ... is equivalent of a loss in food production capacity for at least 350 million people.' (Smil) Current total farmland is estimated at 110 million hectares, reducing by between a half-million to two million hectares annually due to encroachment by industrial and real estate developments.

The official *China Daily* has reported the discharge of over thirty-five billion tonnes of untreated effluents into river and seas, resulting in one-fifth of the country's water reserves being polluted. Meanwhile coastal heavy metal pollution may be among the highest in the world: 'The Yellow River dumped 751 tonnes of cadmium, mercury, lead, zinc, arsenic and chromium, along with 21,000 tonnes of oil, into the Bohai Sea in 1989. The Yellow Sea itself received more than twice that quantity of heavy metals. This study also found that the greatest concentrations of toxic metals occurred in the top layer of sediment – in some cases more than 1,000 times greater than those in the water.' (Platt: 13) Since the seabed is where many species feed and live, heavy metal concentrations have increased in seafood. In 1989 mercury contamination of clams and oysters was over ten times 'acceptable' levels.

These effects have also been traced to individual factories: 'The Qingdao Soda Plant on Kaiochow Bay, for example, has dramatically altered the condition of sediments ... In 1963, 141 types of marine animals – molluscs, crustaceans, echinoderms and the like – were living in these sediments; by 1988, only twenty-four remained.' (Platt: 13)

Direct and indirect economic damage to China's ecology was estimated at 100 billion Yuan ($20 billion) shortly before UNCED's Rio meeting. NEPA estimates 12 billion yuan per year is needed to meet industrial effluent and emission standards by the year 2000. (Florig: 270A) This results from a situation where in 1989 only 55% of all industrial wastewater discharges met the required standard. (Florig: 268A) According to official sources, Beijing, Shenyang, Xian, Shanghai and Guangzhou are among the ten most polluted cities in the world. (*FT* 8/3/95: 8)

Direct damage to the health of the Chinese people has been attributed to the prevalent air pollution. 'Air pollution levels in most large cities largely exceed WHO guidelines. High levels of airborne particulates are thought to be largely responsible for a death rate from chronic obstructive pulmonary diseases five times that of Western industrialized countries.' (Florig: 268A) Other health problems are reported. 'In some north-eastern cities such as Shenyang, heavy metals have polluted drink-

ing and crop irrigation water and led to a surge in birth defects. In Shenyang, pollution takes such a punishing toll that life expectancy is ten years less than the national average of seventy.' (*FT* 8/3/95: 8)

Hazardous waste

The PRC also faces additional problems caused by increased generation of hazardous waste: 'Since 1985 the amount of industrial solid waste in China has increased each year by 4% on average. The accumulated amount of solid waste piled up throughout the country has reached 6.5 billion tonnes, occupying an area of 583.9 million square metres, 40.4 million of farmland and the percentage of toxic waste is still not clearly defined ... the amount of hazardous waste generated by the chemical industry is nearly 20 million tonnes.' (Liu: 275) No assessment of the hazards of toxic waste has been performed.

The PRC is also reported to be increasingly a target of the waste export trade. Greenpeace says China imported 3600 tonnes of hazardous waste, 97392 tonnes of metal waste and 1849 tonnes of plastic waste between 1990 and 1993. (Greenpeace: 5) Much waste is also reported to be exported to Hong Kong as a transit point for the PRC. In the same period Greenpeace research shows that Hong Kong imported 5900 tonnes of hazardous waste, 9348 tonnes of metal waste and 71529 tonnes of plastic waste. (Greenpeace: 5)

Opposition begins

In response to the environmental crisis, conflict is already breaking out in a localised way, similar to that in Taiwan. In June 1988, for example, several people died and dozens were injured when 1000 Chinese peasants near Beijing fought with 2000 police while protesting the government's decision to release waste from a reservoir that had been contaminated by a nearby petrochemical factory. (UNEP News, Dec 88, Supp1)

In other cases peasants have taken the law into their own hands when state regulation has failed to remedy a situation. In March 1992 a pharmaceutical factory in Zhejiang province was fined $740 for dumping toxic waste, despite that waste having inflicted damage upon local seafood breeders' operations to the tune of $180,000.

In response to the state's failure, on 15 June the local breeders stormed the factory and sabotaged it to prevent it continuing to dump untreated

waste. (*FEER* 29/10/92: 43) In another example near the capital: 'In Fangshon Prefecture in the suburbs of Beijing, angry residents have on several occasions blockaded a coal processing plant, which has led to violent clashes.' (Ho: 899)

After Junzhou Copper Mill began operating in May 1994 (in Henan province), it discharged 30 tonnes of SO_2 into the air without treatment. On 15 July hundreds of nearby villagers protested and stormed the plant. Authorities detained ten protestors. A week later villagers organised a sit-in protest, resulting in an official investigation which insisted on the payment of compensation to villagers. (*China Env News* Dec94: 2) In 1993, 830 incidents of rural protests involving over 500 people were reported, twenty-one of which involved over 5,000 people, though it is unclear how many of these conflicts related to pollution and natural resources disputes. (*Econ* 18/3/89: 19-21)

That these cases are not unusual is confirmed by an unusual source, a pollution equipment industry analyst, who ascribed recent urgency in pollution control adoption to popular opposition: 'Part of the urgency is fuelled by increasing numbers of irate rural folk whose livelihoods are threatened by industrial pollution in the countryside: There are a lot of instances where peasants are storming the gates of some small township factory that has just wiped out their rice-paddy with waste-water effluent.' (*FEER* 26/6/97: 67)

However, China has yet to see strong growth of environmental groups. While there has been unprecedented opposition to the Three Gorges Dam, and in March 1995 hundreds of middle-class residents of Shanghai virtually sealed off an entire block of Shanghai's 'Golden Mile' in a standoff with police in protest against demolition of old city neighbourhoods for proposed commercial developments, (*FT* 11/3/95: 4) the PRC power elite justly fears the growth of any environmental opposition: 'Although local Environmental Protection Bureaus are receptive to citizens' environmental complaints, the Chinese government is reluctant to allow formation of independent activist environmental groups.' (Florig: 273A)

The reasoning is obvious. The CCP has learned from the experience of eastern Europe, where pollution issues provided opportunity and cause for public agitation and conflict. One western environmental expert opines, 'Chinese officials are drawing lessons from eastern Europe. One of the nightmares of officials in Liaoning and Jilin (provinces in China's

heavily polluted north-east) is the emergence of a Greenpeace mass action movement in reaction to an environmental disaster.' (*FT* 8/3/95: 8)

The current regime has a long history of repression of political dissent to draw on. Opponents of projects on environmental grounds are justly afraid of the state's repressive response. Where movements have been formed they have faced repression, which may lead to liquidation, as in the case of the Three Gorges Dam: 'In May 1992 police arrested 179 members of the Democratic Youth Party in Kai County and charged them with counterrevolutionary activities aimed at sabotaging the progress of the Three Gorges project. To this day none knows their whereabouts or legal status; inquiries by journalists and diplomats have gone unanswered.' (Topping: 134)

With these risks, such green NGOs as have been founded are well aware of the limits of permissible discussion. Formally registered environmental organisations grew from one in 1967 to four in 1992, and doubled from nine in 1995 to eighteen in 1996, while the number working in these groups increased to 4000 in 1997. (Ho: 901) There is also considerable evidence of non-registration as well as registration in disguise. Thus Ho reports, 'Over the past few years, the People's Republic has seen the emergence of a broad range of green organisations, varying from hierarchic, top-down public lobbies working from within the bureaucratic system, to participatory grassroots organisations that employ tactics of mass mobilization.' (Ho: 897) In this it mirrors the worldwide environmental movement but, with the exception of local struggles where mass mobilisation occurs, 'it lacks both the opportunity and the immediate urgency to confront the central government.' (Ho: 897). The official movement is then mainly operating educational and some legal services, but no attempt is made at national mobilising or campaigning. Such gains as are made are due to their influence on and contacts with the environmental bureaucracy. (Ho)

Government response

Government response to and regulation of the environmental crisis has been a failure. PRC has put much legislation in place, and formed an environmental bureaucracy. Following the passing of the 1979 Environmental Protection Law statute, provincial, city and county level Environmental Protection Bureaus (EPBs) were formed, which, by 1995, employed over 200,000 people. In 1984 the Environmental Protection Com-

mission (EPC), comprised of all relevant ministry and agency heads, was set up by the State Council, to set out broad environmental policy. In 1988 the EPC raised the Environment Office in the Ministry of Urban and Rural Conservation and Environmental Protection to the status of a full agency, the National Environmental Protection Agency (NEPA). (Florig: 269A)

Glaeser, in a highly sympathetic article, puts his finger on the major problem. Despite the rhetoric and the environmental legislation, implementation is, as always, lacking: 'Environmental policy has never been fully implemented, despite intentions, consistency and bureaucratic institutionalisation. The country simply lacks the financial resources to install expensive technology on a large scale. There is little incentive at factory level to implement costly policies. There is insufficient enforcement of pollution fines, because this would involve the state, as property owner, taking money out of one pocket and putting it in another ... Successive failures of economic reforms suggest that not much more can be expected of environmental policy.' (Glaeser: 263)

This is so, despite the PRC having followed international advice to set up an economic incentive system to end pollution. Under the 1979 trial environmental law, fees could be charged to enterprises emitting larger pollution loads than permitted. While this 'pollution fees' system was intended to provide economic incentives for pollution controls (in line with OECD recommendations) it failed to do this: 'The pollution control incentive provided by the levy system is low because fees are small relative to pollution control costs. Fees are not indexed for inflation, and for state-owned enterprises, they can be included under costs and later compensated through price increases or tax deductions. Thus, many enterprises choose to pay the fees rather than incur pollution control costs, which often require significant capital investment. Because the fees and fines can be lower than operating and maintenance costs, enterprises that install pollution control equipment have little incentive to operate it.' (Florig: 270A)

While collection of these fees has grown steadily over the past decade, this is due not to increasing fees, but an increase in the number of enterprises assessed for fees. Some indication of exactly what this system lets Chinese industry get away with is provided by a comparison with US industry in 1993. 'For firms that pay discharge fees, the fees typically make up less than 0.1% of the firm's total output value. By comparison,

US industry compliance costs are estimated to be a little more than 1% of total manufacturing costs.' (Florig: 270A)

The pollution levy system also suffered from appeals by enterprises to other and higher local officials, mainly in rural areas. 'Because of the threat to the economic welfare of vital local enterprises, officials often preferred to waive the fees, particularly for unprofitable enterprises.' (Florig: 271A) One example of this is provided by Liaoning province where many large bankrupt heavy industries are regularly excused from making payments. Here the strong state operates soft law.

PRC has followed international fashion by introducing EIAs, which operate mainly as a legitimising exercise. A recent review noted, 'Such studies are to produce suggestions on how to improve the project's design and to reduce its impact, but definitely not to serve as inputs to the decision on whether or not to implement the project,' (Ip: 119) and 'ultimately ... impact assessments are exercises aimed at facilitating the implementation and legitimation of officially-sanctioned projects, rather than the shaping and designing of alternatives in the decision-making process.' (Ip: 121) A more recent review, confined to Guangzhou, points to the difficulties involved in self-regulation, to the importance attached to economic development over environmental protection, lack of staff and funding and a total absence of popular participation: 'Formal public participation is not part of the EIA system ... [which] ... is dominated entirely by environmental agencies without any forum or provision for public participation or consultation.' (*EIAR* 17: 376, 1997)

The situation in the PRC has been summarised as follows: 'The development of environmental laws, regulations and infrastructure has greatly improved, but monitoring and enforcement are still major problems. Compliance has been best for large new facilities because abatement equipment was incorporated in the early design stages. But many medium- and small-scale enterprises, particularly rural ones, feel little or no pressure to comply, and larger enterprises operating at a loss can manoeuvre for exemptions. With economic reforms diminishing the central government's control, a strong bias favouring economic development over environmental protection, and no support from an independent environmental movement, environmental protection in China faces an uphill battle.' (Florig: 272A)

Still the regulations have, as would be expected, led to the creation of an environmental protection industry: there are over 4000 enterprises

in the PRC making pollution control, monitoring and recycling products. (Florig: 272A)

Occupational safety and health

Since the PRC proclaims itself a workers' state, it seems fair to conclude by examining the state of its workers. The latest official statistics on occupational safety show that industrial accidents and fatalities are increasing hand in hand with the growth of economic activity. Over 15,000 workers died in the PRC in industrial accidents in 1992, a 3% increase over 1991. State officials blame the increase on negligence by companies who increase output at the expense of worker safety, the boom in the Chinese economy and the proliferation of new businesses, many of which pay no attention to worker safety. (*FT* 24/4/93: 3) Despite this clarity over causation, the situation is not improving. In 1993 over 20,000 people died in industrial accidents in the PRC. (ICFTU: 27) A worker safety journal reports, 'In 1993, an average of fifty-four people a day died in industrial accidents in China, according to government figures, but labour activists put the number at two or three times higher. Of China's 150 million manufacturing workers, the *China Daily* reports one in ten works in "dangerous" conditions.' (*WHIN* 42: 15)

There are strong grounds for believing official statistics underestimate the problems. Many enterprises fail to report accidents to avoid payment of fines and compensation. A survey of one township found that, of forty-five industrial accidents in that township in 1987, only fourteen were reported to the authorities.

By late 1986, non-state-owned enterprises, such as collectives and privately-owned firms, accounted for 27% of the total workforce. 'The workers in many of these enterprises are now working routinely in environments with very high concentrations of dust, fumes/gases and other hazardous substances, often with no or inadequate control measures.' (Xu: 87)

A survey in 1989/90 of 29,246 mines and enterprises in fifteen provinces and municipalities of the PRC found that workers were exposed to high levels of dust, noise and hazardous substances in 83% of the sites surveyed. The most dangerous sectors included manufacture of building materials, machinery and plastics. (*International Labour Review* 132 (2): 128) More recently the Xinhua News Agency, run by the Chinese state, reported that half a million workers were exposed to toxic leaks in 1993. (*Newsweek* 12/12/94: 21)

Some indication of standards can be found in the case of a Hong Kong joint venture factory in Zhongshan in Guangdong province, which manufactured toy telescopes, spectacles and other plastic products. Three workers died and over ninety were hospitalised in an incident involving the highly volatile chemical 1,2 dichloroethane. To prevent poisoning by this chemical, there should be respiratory equipment and good ventilation, with the chemical kept in tightly closed containers. The situation in the factory describes an accident waiting to happen:

'Workers said they were never told of the poisonous nature of the adhesive, nor were they given any precautions. The adhesive was just loosely placed around the factory's workroom ... Investigators found the factory's ventilation system inadequate. To compound matters, the factory's windows are closed during production hours, allegedly to prevent dust pollution. At the time of the incident, the workers were doing overtime. Accumulated vapour of the poisonous chemical was so high that thirty-six hours after the windows were opened, it was found to be still above safety standards.' (*Asian Labour Update* 14: 13)

For another hazardous chemical, benzene, the situation sounds appalling, with some 73% of shoe-making workshops in Beijing reported as having levels higher than permitted. Meanwhile, in Wenzhou, Zhejiang, the local health authority reports that over 5000 workers in shoe-making factories are suffering from benzene poisoning. (*Asian Labour Update* 14: 13)

Burning factories

If occupational hazards are ignored, so is industrial safety. In recent years there have been many fires and explosions at factories using hazardous chemicals in the PRC. 'Tens of thousands of young workers, many of them women, have lost their lives in an epidemic of factory fires, explosions and accidents that has swept the coastal zone in recent years. The international press routinely report fires and explosions at factories in the PRC.' (*Permanent Peoples' Tribunal*: 19) A fire at the Taiwan-owned Baixing Garment Factory in Shenzen killed 16 and injured 12 critically; in May 1991 fire at a Hong Kong-owned raincoat manufacturing company in Guangdong killed 80 and left 40 severely burned; in March 1992 an explosion in the Yangqiao Chemical factory in Chanshu, east China, killed three workers while 7 workers were critically poisoned by benzene in a toy factory in Guangdong. (*PPT*: 19)

Late 1993 saw a major eruption of the burning factories syndrome. The first disaster occurred when the Anmao Dangerous Goods Shipping and Storage depot in Shenzen, Guangdong, exploded on 5 August. According to local authorities only thirteen people died, a highly unlikely number: 'The number, however, seems low in light of news footage aired on Hong Kong television on 8 August that showed the second, and largest, explosion erupting just as thousands of fire-fighters had mobilized to fight the earlier blaze. What's more, the official Xinhua news agency reported a day after the event that seventy people died.' (*FEER* 19/8/93: 54) Some 200 people were reportedly admitted to hospital. (*Guard* 6/8/93: 10)

The reluctance to enumerate the body count correctly may stem from the owners of the depot, none other than the People's Liberation Army, whose competitive advantage included no regulation by the state. 'Military officers at some of the facilities we've visited boast about their freedom from civil authority,' one foreigner told the *Far Eastern Economic Review*. (19/8/93: 54) Certainly Anmao had ignored laws on the storage of dangerous goods by keeping ammonium nitrate in their warehouses.

The problem is of course not confined to the PLA. An executive of a multinational toy company with major operations in the area told the *FEER*, 'Industrial safety is the last thing that anybody worries about in Shenzen, or anywhere else in the province, for that matter.' In 1992 deaths from industrial accidents in the Shenzen Special Economic Zone (SEZ) increased 173% over the previous year. For Guangdong Province, the increase to November 1992 on 1991 figures was 62%. The all-China rate of increase was 3%.

Disaster struck Shenzen SEZ again on 19 November 1993 – eighty-one workers, mainly women migrant labourers, died when fire struck the Zhili Handicraft Factory, a Sino-Hong Kong joint venture which manufactured Christmas dolls for export. Many of those who died were trapped as doors and windows had been locked to prevent theft. Thirty-one women were injured, six critically. (*Indep* 21/11/93: 1) Local residents said the dead, many of whom were asleep between shifts, may have numbered 200. The Shenzen fire marshal, Cai Yanda, noted, 'The area had no fire department of its own. The nearest water main was three kilometres away.' In September 1994 two fire inspectors went on trial charged with taking bribes to ignore the company's failure to comply with safety regu-

lations: 'The inspectors found two exit gates welded shut and a circuit breaker that might have stopped an electrical fire improperly connected with copper wire. The bribe to ignore this flouting of the rules was just $390.' (*Newsweek* 12/12/94: 21)

A Shenzen government official attacked foreign investors, particularly Hong Kong-based investors, for trying 'to save money by installing below-standard safety facilities.' (*FT* 22/11/93: 4)

The following month disaster struck a textile factory operated by a Sino-Taiwanese joint venture in the Mawei development zone of Fuzhou, south China, killing sixty workers. (*Guard* 14/12/93: 14) In October 1993 the official *People's Daily* attacked local leaders who attached more importance to production than to safety, while also pointing out that too many untrained migrants were working 'in dangerous and difficult work conditions'. The situation is as bad in cash-starved public enterprises as it is in quick-buck private firms.

The final official figures for the body count in factory fires in 1993 was 2467 people. (*Guard* 7/2/94: 9)

After an explosion in June 1995 at a polyester factory in Zhuhai in Guangdong killed at least two workers and injured some twenty others, a senior official of the Labour Ministry admitted it feared that economic development would be affected if they attempted to further control foreign investors. 'Drafting of new legislation to help protect China's workers has been restricted and publication delayed so as not to discourage foreign investors and thus slow down the country's economic development.' (*WHIN* 45/46: 4)

'The same senior official disclosed that the draft new legislation, which was reviewed more than ten times, would give labour inspectors greater powers to monitor safety management of foreign-funded companies, especially those with high accident rates. Barriers to the implementation of the laws remain very strong, however. "The economic conditions of many regions have not developed into a mature stage," the official said. "That's why some provincial officials, especially in the South, are reserved about putting further controls on foreign investors."' (*WHIN* 45/46: 4)

While the UN Conference on Women's Development was underway in Beijing in September 1995, the PRC was struck by another of its murderous factory fires. In this case twenty-six women died and sixty-six

were injured in a fire in a cigarette lighter factory in Shunde City in Guangdong province. The ICFTU representative at the Conference was refused a request to visit the site to examine working conditions there and speak to survivors. The *Hong Kong Standard* reported police forcibly prevented reporters from approaching the scene of the fire. Lois Stewart of the ICFTU said, 'In China, fires and factory collapses happen all the time. Over 6,500 people died in 6,900 industrial accidents this year.' (*MM* Oct95: 4)

Workers unite

Both left- and right-wing observers agree that the main threat to the CCP project comes from the victimised peasant and working classes. As early as 1994 *Business Week* (6/6/94: 56) reported the existence of over 800 illegal trade unions set up by workers angered by dangerous factory conditions. As the state's attempt to smash the iron rice bowl proceeded in the late 1990s, so opposition and protests increased.

In March 1997, some 20,000 workers in Nanchong, Sichuan held a textile plant manager hostage until the state ordered local banks to pay months' worth of back wages. In July 1997 troops were called in to Mianyang, Sichuan, when some 700 irate workers of the bankrupt Mianying Silk Printing and Dyeing Factory protested, setting up roadblocks. As many as 100 people were injured during the repression that followed. In September 1997 laid-off workers clashed with riot police in Dujiangyan, Sichuan. In October 1998, 500 workers from an iron and steel factory in Sichuan staging a sit-down strike on a vital railway line were attacked by armed police. On 12 January 2001, 4000 workers from Jilin Industrial Chemical Group blocked a public highway for three days in sub-zero conditions. Since 1 March 2002 tens of thousands of laid-off workers gathered daily for two weeks at the offices of Daqing oil field to protest cuts in severance payments. Labour rights groups claim that as many as 50,000 workers have been involved and authorities had readied paramilitary police and an army tank regiment to deal with the protests. In April 2002 ex-workers of the Ferro-Alloy Company of Liaoyang protested by marching to the factory daily for a few weeks.

And these are but the tip of the iceberg of labour dissatisfaction. 'The World Bank estimated 36 million workers have lost their jobs over the last three years. There are at least 100 million workers already displaced into insecure jobs in the informal sector and 70 million more expected to leave farms over the next ten years.' (*Guard* 8/4/02: 21) This

dissatisfaction is also fed by the growing income gap between the haves and have-nots: according to the ADB, per capita income of the top 20% of the PRC's urban population jumped 9.6% to $1,360 in 2002, while that of the bottom 20% grew only 2.7% to $377. (*BsWk* 8/4/02) In 1999, the most recent date for which statistics are available, 'there were some 100,000 demonstrations by workers and farmers protesting against low wages, unpaid pensions and corruption.' (*BsWk* 22/10/01: 47)

Notes

(1) For a revealing analysis of the irrationality of state production in China, and much else, see Smith. For a less critical view than Smith's see *New Left Review* 208: 49-76. On SEZs see *International Journal of Urban and Rural Research*: 197-215 and *Bulletin of Concerned Asian Scholars* 20(3): 2-21. For further material on China's economic development see *Time* 27/6/94: 28-34; *BsWk* 31/1/94: 14-20; *BsWk* 17/5/93: 20-31; *Fortune* 7/3/94: 34-39; Dwyer, D (1994) 'China: the consequences of liberalization' in Dwyer, D (ed) *China: the next decades*, Longman, pp.156-185; *BsWk* 6/4/92: 22-24; *Fortune* 26/7/93: 86-92; *Professional Geographer* 42: 403-421; *Fortune* 9/3/92: 32-39. See also *Review of International Political Economy* 3(1): 1-26.

(2) Further references to convict labour may be found in *FT* 4/4/90: 1,24; *WSJE* 20/5/94: 6; *BsWk* 13/4/92: 15-16; 22/4/91: 42-44; *Guard* 19/5/94: 14; *Sunday Times* 15/5/94: 1.15 and in Wu, H H (1992) *Laogai*, Westview

(3) For women in the Chinese labour force see *American Sociological Review* 60: 378-397; *Bulletin of Concerned Asian Scholars* 20(3): 22-41

(4) For material on the Chinese chemical industry see *FEER* 19/8/93: 54-55; *CEN* 24/2/93: 18-20; *CEN* 24/2/92: 9-11; *ECN* 12/7/93: 14-17; *HP* June94: 50B-50H; *APC* June94: 33-37,44-45; *C&I* 3/10/94: 763-769; *ECN* 4/10/93: 16; 7/2/94: 18-19; 21/2/94: 20;10/7/95: 18-21; 24/7/95: 22; 26/6/95: 14-16; *ACN* 10/7/95: 12-13; *HP* May94: 49-50. On Sinopec see *FEER* 29/7/93: 50-51.

11

India

Liberalisation of toxics

After independence from Britain in 1947 the Indian state adopted a policy of import substitution industrialisation (ISI), with a strong emphasis on the development of heavy industries after the Soviet model and with strategic state control in certain industries. 'Indian state elites made explicit their overwhelming commitment to industrialisation at any cost soon after independence. A symptomatic quote from this period, from India's first Prime Minister, Jawaharlal Nehru, captures this desire concisely: "Now, India, we are bound to be industrialised, we are trying to be industrialised, we want to be industrialised, we must be industrialised."' (Krishna: 120) During this period India played the two hegemons, the USA and the USSR, against each other and, through the judicious use of US food aid, diverted investment which would have gone to agriculture to industrial development instead: this allowed India to 'effect a transition from peripheral to semi-peripheral status within the world system.' (Krishna: 121)

This policy was followed religiously, with strong state control of the economy the norm until liberalisation began in the 1980s. 'By 1980 a foreign exchange crisis surfaced, and the government of Indira Gandhi took a large loan from the IMF. The changed perception of the government as well as the notorious IMF "conditionalities" led to further liberalisation, not only in respect of commodity imports but also of for-

eign capital. The process was greatly accelerated with the advent of Rajiv Gandhi to power in late 1984.'[1] (Chandra: 680)

This liberalisation led to a spurt in foreign collaborations. In the period of the Sixth Plan (1980-1985) 'export incentives were offered with the establishment of FTZs in which virtually all restrictions and procedures of the domestic tariff areas were removed. To give this policy wider coverage, most of the facilities available in these zones were later extended to units producing exclusively for export, even to those under the domestic tariff structure, under the "100% export-oriented units (EOUs)" scheme of 1980.' (Korgaonker: 25) By the end of 1994 these EOUs and EPZs were responsible for 10% of India's exports which were forecast to grow to 25%. (*ToI* 2/1/95: 15)

The growth of foreign collaborations is shown by the government of India approving 1,024 cases of collaboration in 1985 alone, while from 1948 to 1985 only 10,025 cases were approved. 'Government policy seems to prefer pure technical collaboration rather than financial participation by TNCs, as is evident from the fact that only 19% of the total cases involved financial collaboration.' (Korgaonker: 25) Chemicals, drugs and pharmaceuticals was the third most important area, with 318 approved collaborations, following electrical equipment and industrial machinery. (Korgaonker: 29) Locally-based technology vendors, such as Uhde India, prospered during this period. (*BsIn* 4/1/93: 83-84) 'The total investment by TNCs was estimated at around US$2.5 billion in 1984 (roughly 10% of the private corporate sector investment or 5% if the public sector is also taken into account).' (Korgaonker: 25) Over 75% of this investment came from four countries: England, the US, Germany and Japan.

The second major spurt of economic liberalisation came in mid 1991 with the reforms of the Rao government. This involved the near deconstruction of the licence Raj, opening key sectors to foreign capital, competitors and contractors, ending state monopolies, slashing import tariffs and preparing privatisation plans. However, reform has continued to face difficulties and, a decade into the process, India only accounted for 0.7% of world trade and remained a largely self-contained, if sluggish, economy. This self-sufficiency allowed the country to survive the AFC, as it had little foreign capital waiting to exit and local capital was denied exit through a system of strict capital controls.

Foreign capital finds India attractive for the same reasons it does China. Indeed, India has further advantages over China: 'Foreign finan-

ciers point out that India has many assets that China lacks – a base of veteran entrepreneurs, an English-speaking elite, well-established capital markets and a rule of law.' (*BsWk* 30/1/95: 41) The importance of the Indian market can be seen in the distressing statistic that India's annual military expenditure is $12 billion, including $5 billion on equipment and hardware. 'India is a mega economy. Outside of the US and Europe, you don't get many economies like that. Maybe India, China and Brazil,' explained an executive from BAE Systems. (*FT* 27/2/02: 10)

In a survey of 230 leading MNCs by Ernst and Young, India was named as a 'priority country' for future investment by 17% of those surveyed, a figure second only to China. (*WSJE* 12/1/95: 2) Many of these MNCs are of course slavering at the mouth at the thought of access to the massive market provided by the Indian middle class. As to their investments in India leading to India becoming a major exporter of manufactured goods, following in the tradition of East Asia, 'it is significant to note that the World Bank report on Trade Reforms in India (datelined October 1990) envisaged that after five years to economic reform – of the type currently implemented – Indian exports of minerals and raw materials would increase, Indian exports of manufactured articles would decline, and indeed, even the domestic output of capital goods would decline. The implication is that India is not fit to go in for the manufacture of industrial products: it must remain a producer of primary commodities.' (Ghosh: 423)

Since 1991 some $7 billion in FDI has been approved by the Indian government: in the previous four years total FDI had been $250 million. Around one-third of this investment has been by US-based MNCs. According to India's New York commercial consul, 'FDI from the US in 1992-93 exceeded total US FDI in the previous 40 years. In the first ten months of 1993, US companies invested $800 million in India, with another $2.2 billion in the pipeline by the end of the year. In 1990, for comparison, total US investment was $90 million.' (*FT* 30/3/94: SuppV) Others are eager to enter the fray. Marubeni Corporation of Japan is reported to have earmarked $1 billion for investment in ten projects in India, while Mitsui is planning investments in textiles, chemicals, engineering plastics and pharmaceuticals. (*IHT* 5/10/94)

The figures quoted, however, are of approvals: actual investment flows are much lower. 'In 1993 New Delhi approved $2.5 billion in foreign investments ... Since government follow-through remains slow and complicated, however, less than $450 million of the approved amount has flowed into the country.' (*Time* 10/1/94: 27)

In the fiscal year to March 1994 foreign investment in India increased to $4.7 billion. Most of this was not FDI from multinational corporations but equity investment in Indian companies. 'About $4 billion of that has been put into shares traded on Indian stock exchanges or global depository receipts by institutional investors around the world.' (*Fortune* 5/9/94: 89)

However, FDI has remained problematic. Between 1991 and 1998 only a quarter of all approved projects led to FDI inflow, with many deals failing due to the high prices requested by local owners. In other cases, state failure is involved. Shell abandoned plans in June 2001 to purchase 49% of NOCIL's petrochemical arm, having waited three years for regulatory approval. More generally MNCs' share in India's M&A market fell from 57% in 1999 (of a $9.3 billion market) to 39% of $3.6 billion deals in the first half of 2001. (*TT* 26/11/01) Many of these deals involved MNCs pulling out. The power industry is a useful indicator of the fate of MNCs: 'Less than half the "fast-track" projects that were launched a decade ago have been concluded, and eight of the foreign power companies behind them have left India in the past three years, with four more about to follow.' (*FT* 6/11/00: Supp2)

As well as encouraging FDI, liberalisation policies have allowed indigenous companies to raise capital on global markets. In 1995 some $3.4 billion was raised by 42 Indian companies through issuing global depository receipts, (*BsWk* 30/1/95: 41; see also *BsWk* 12/12/94: 42) while total foreign purchases of new Indian equity-linked paper in 1994 reached $4.6 billion. (*WSJE* 12/1/95: 2)

This period has involved major investment plans not only by MNCs but also by Indian capital. In 1994, five oil refineries and nine petrochemical complexes, involving total investment of some $30 billion were planned, mainly by Indian companies. (*FT* 30/3/94: SuppV)

One result of the liberalisation is the speed with which new projects now get approval. Whereas under the licence Raj decisions could take years, 'now government officials make most decisions in a matter of weeks, and the answer is almost always yes. When Coca-Cola decided to go it alone in India after dissolving its joint venture with an overseas Indian partner, Coke got permission for a 100% owned unit in India in eight weeks.' (*Fortune* 5/9/94: 89) Another example was provided in November 1992 when a $25 million wholly-owned citric acid plant proposed by Cargill was approved after only about ten days. (*BsAs* 26/4/93: 6) An-

other example is MSL, a copper recycling plant whose plans for Goa faced strong opposition when they were made publicly known: 'In all it took six days for a high-power control committee to approve the project, five days for Goa State Pollution Control Board to approve the project in principle, and only sixty-nine days for all the authorities to clear the project, including site approval.' (*DTE* 31/7/00)

Petrochemical development

India was one of the first peripheral countries to develop a petrochemical industry and is also one of the few peripheral countries in which MNCs were involved in building capacity for basic petrochemicals, with UCC setting up a wholly-owned ethylene plant in Mumbai in 1966. Two years later another petrochemicals complex was set up to be operated by two joint ventures – National Organic Chemical Industries Ltd. (NOCIL), a joint venture between Shell and an Indian private company, Mafatlal; and Polyolefins Industries Ltd. (PIL), a joint venture between Hoechst and NOCIL. A critical OECD report notes, 'Even by standards of the time, both complexes were extremely small, far below the size required to reap scale economies.'[2] (Oman: 94)

Further development continued with similar effect. 'In 1972, a third and only slightly larger ethylene plant was commissioned ... As a result, India found itself with one of the most costly and inefficient basic petrochemicals industries in the world. Output has constantly lagged behind demand, and prices have been consistently higher than average world market prices.' (Oman: 95)

The chemical industry

Growth in the Indian chemical industry has been impressive, with volume of production increasing from a value of $120 million in 1950 to $11,400 million in 1981, making it then the twelfth largest chemical industry in the world. 'As of 1981 figures, the production of chemicals contributed from 7.5 to 8% of the Gross National Product.' (Krishna Murthi: 277) Currently, the Indian chemical industry is tiny in global terms, producing 2% of world chemicals, (*CEN* 17/8/98: 21) while the Indian chemical market is described by Martech Consultants as relatively small, with a value of $30 billion. (*CEN* 17/8/98: 25)

By 1985, the Indian fertiliser industry was the fourth largest in the world, worth over $4263 million and expected to rise to $12,000 million by 1986-87, consisting of 33 nitrogen and complex fertiliser plants, six

ammonium phosphate plants, three super phosphate plants and forty single super phosphate plants. (Kulkarni: 15) Pesticide production in India also began in the 1950s. By 1983 total production was 68,000 tonnes a year. Production consisted of forty-four different types of pesticide produced by 800 formulators and fifty large manufacturers. (Kulkarni: 15)

The drug industry sector in India consists of 2500 small companies and 128 big companies, only forty-five of which are MNCs. 1983 production of bulk drugs was valued at $665 million and production of formulations was $2400 million. (Kulkarni: 15) By 1994, fine chemicals production in India was estimated at $1 billion, approximately 50% of which is exported. Some of this production was highly sophisticated. E Polastra of A D Little observed, 'The supply structure is represented by small local companies often having close ties together and able to compete on the world market thanks to low labour and environmental costs and indirect government subsidies.' (*CMR* 7/2/94: SR22)

Indeed, local promoters of industrial development tout the 'pollution haven' advantage. 'The Maharashtra Development Council published a paper in April in which it states that one of India's competitive advantages, as far as the chemical industry is concerned, is that companies are comparatively free to pollute there.' (*CEN* 17/8/98: 23) A similar environmental indifference is seen to lie behind India's picking up of toxic niches, such as benzidine dye production. A Nordic academic confirmed this, noting, 'In the 1980s the rupee value of Indian (dyestuff) exports increased tenfold.

This coincides with stricter environmental regulations in many developing countries which affect this industry,' (Knutsen: 199) and concludes, 'Poor investment in pollution abatement in the Indian dyestuffs industry is one of many factors which make India price competitive on the international market. In addition India produces and exports some products whose production is being phased out or is being discontinued for environmental reasons in other countries. Thus, pollution constitutes a part of the competitive advantage of the dyestuff industry in India.'[3] (Knutsen: 209)

Speaking in New York in January 1995, India's US commercial consul detailed India's new welcome for foreign investors and 'its special warmth towards chemical investors.' (*CMR* 23/1/95: 22) He estimated the potential Indian market for fertilizers at $2.5 billion, pesticides at $1.1 billion, farm chemicals derived from petroleum at $4.2 billion, plas-

tics at $610 million, basic inorganic chemicals at $130 million, caustic soda at $100 million, carbon black at $80 million and potassium chlorate at $40 million. (*CMR* 23/1/95: 22)

Thus the new liberalisation policy will inevitably lead to expanded production and consumption of petrochemicals. During the seventh Five-Year Plan period (1986-1990), GNP grew 5.5% annually, while growth rates for the industrial sector were 8.8% annually and those for the chemical and petrochemical industries were 10% and 12-15%. (*Indian Express* 30/1/95) K G Ramanathan, chairperson of IPCL, predicted in 1995 that the Indian petrochemical sector could look forward to growth rates of 14-15%. (*Economic Times* 1/1/95: 7) In March 1995, Secretary of Petrochemicals K K Mathur claimed that the Indian economy was now growing at 8% per annum, with the chemical industry expanding at 10% a year and the pharmaceuticals industry over-performing at 12-15% a year. He noted if all currently planned capacity comes on-stream, India will be self-sufficient in petrochemicals by 2000, with consumption doubling to 7 million tonnes a year. (*ECN* 13/3/95: 5).

Growth rates of 11-15% were the average for the 1990s, with expected growth of 9-12% in 1998 and 10% in 1999. More recently, growth rates have slowed to 3-4%. (*CEN* 15/4/02) Ethylene capacity, 525,000 tpa in 1996, jumped to 1.7 m tpa in 1997 and was expected to reach 2.5 m tpa by the end of 1998, according to a study by Martech Consultants, who estimated India would remain an importer of plastic resins by 2000 but would have a surplus of synthetic fibres. (*CEN* 17/8/98: 22)

Prospects for further growth are tremendous. Pace Consultants told *European Chemical News* that 'India has the largest potential market of any country in the world, including China.' Reliance estimates that Indian per capita consumption of plastics is 1.7 kg compared with a world average of 15.4 kg. The Rakesh Mohan Committee, an advisory committee to the government of India, estimates that demand for commodity plastics will double to around 3 m tonnes/year by 2000. This would result in a per capita consumption of 3 kg., still well below the world average. (*ECN* 3/4/95: 19)

The industry had major problems in expanding, partly due to the 'licence Raj': 'Before July 1991 chemical firms in India were restricted to building plants to fulfill indigenous needs. This meant capacities were small and larger, more cost-effective plants which would have brought down manufacturing costs and resulted in more efficient outputs and

productivity could not be constructed. Now new legislation has done away with the restrictions to plant size. India can build worldscale plants at a fraction of the cost incurred elsewhere.' (*ECN* 6/3/95: 16)

The recent liberalisation of industrial licensing controls by the Indian government led to major plans for petrochemicals production. Applications to the government by 1989 envisaged the building of 2.7 million tonnes of ethylene capacity at a cost of some $5 billion. (*Econ* 15/7/89: 58) Following de-licensing of petrochemicals in 1991, 'Indian government and private companies are planning to invest Rs 500 billion ($16 billion) in existing and new refineries, to add 63 m tonnes of capacity to the country's current total of 52 m tonnes. They also plan to spend Rs 240 billion on nine new petrochemical ventures and double output of petrochemical products to about 6.3 million tonnes a year by the late 1990s. The total proposed outlay is greater than for any other sector except power. Most of the investment will be funded by Indian money.' (*FT* 10/12/93, 28)

These plans have been dependent on international capital and technology. In the case of NOCIL, what was at stake was the future control of the company. Shell disinvested in December 1992, following Mafatlal's refusal to increase Shell's equity stake in the joint venture from 33.33% to 51%. (*ACN* 31/7/95: 21; *FT* 19/12/92: 10) State-owned Indian Petrochemical Corporation Ltd (IPCL) has been forced to change its plans for its Gandhar Petrochemical Complex in Gujarat, following its failure to obtain closely-guarded technology for its proposed alpha-olefins unit, which was available from only three MNCs – Shell, Ethyl and Chevron. Following failure to arrange a technology transfer agreement for the needed technology, IPCL offered to run joint ventures with the technology suppliers holding equity participation. Despite extensive discussions, IPCL failed to arrange such a joint venture to the satisfaction of both sides. (*ACN* 13/3/95: 21)

IPCL was more successful in obtaining foreign capital. In October 1994 it announced that it had obtained a direct loan of $46.4 million from the US Export Import Bank, the first tranche of a proposed $132.2 million loan to be used to purchase US capital goods for the company's Gandhar project. (*ECN* 31/10/94: 5) In December 1994, IPCL began a two-week road show in the US, organised by Goldman Sachs, aiming to draw in $85 million in foreign money. (*CMR* 28/12/94: 18)

Other companies plan to draw on international funds, facilitated by the government's decision in mid 1996 to relax restrictions on Global

Depository Receipts and external commercial borrowings. The response is described by an industry journal: 'Lining up for Euro issues are a host of petrochemical firms including Indian Petrochemicals Corp Ltd (IPCL), Gujarat Alkalies and Chemicals (GAC), Grasim, Mangalore Refineries and Petrochemicals, Gujarat State Fertilisers Corp, Haldia Petrochemicals and Atul Projects.' (*ACN* 15/7/96: 7; 19/8/96: 12-16)

Reliance petrochemicals

By 1993 Reliance was listed by *Business India* as the number one of the top 100 companies by market value in India, with a value of Rs 7586.05 crore, a 37.05% increase on the previous year, (*BsIn* 8/11/93: 66) making it the largest company in the Indian private sector. Its expansion plans will turn Reliance into the eighth largest polyester producer and among the biggest makers of key petrochemicals in the world. (*BsWk* 20/11/95: 58) Reliance's late chairperson Dhirubhai Ambani told the company's annual shareholders' meeting in July 1996 that the company is set to become a 'global force' in petrochemicals with its Hazira complex, which when on-line would raise the company's total output to 6 million tonnes a year by 2000, from the 1995 production figure of 1.5 million tonnes. This will more than double sales to a value of Rs 200 billion ($5.59 billion) in 2000 from a 1995 figure of Rs. 78 billion. 'The complex includes the world's largest single-stream multi-feed ethylene cracker.' (*FT* 19/7/96: 23) Globally, Reliance is the 37th largest chemical company, with sales of $6.23 billion and profits of $1.2 billion in 2000. (*CEN* 23/7/01) Locally, its production of petroleum and petrochemical products accounts for 3% of India's GDP. (*BsWk* 25/6/01)

Reliance has benefitted from liberalisation: 'When India began opening its markets in 1991, many thought the company would collapse under pressure from much larger global competitors such as Du Pont and Hoechst. Instead, Reliance's revenues have grown 137% to $2.2 billion, since the fiscal year that ended 31 March 1992. Net profit has grown more than five times, to $338 million and profit margins have reached 15%, compared with 5% in 1992. "The reforms have been the greatest catalyst for growth," says Ambani.' (*BsWk* 20/11/95: 59)

Reliance claims to have dominant market shares in most of its products, ranging from 53-78%, with some 97% of its production aimed at the Indian market. In 1998 it claimed to be the largest producer of ethylene glycol, the second largest PP and third largest PE producer in Asia. An executive described its strategy: 'What matters in our type of busi-

ness is the volume. You cannot afford to be a niche player. You have to be one of the major ones. So, in almost all the product lines that we are in, we are in the top ten or the top five in the world.' (*CEN* 17/8/98: 25-26) Critics note the company's lack of R&D and claim its major competitive advantage is its ability to obtain licences from the Indian state.[4]

MNCs re-enter

Before looking at the new entry of foreign capital, we need to glance at the position before liberalisation. While prior to the recent reforms India has been presented as unwelcoming to foreign capital, the true picture is more complicated. As well as traditional foreign direct investment (FDI), foreign capital prospered also through new forms of investment (NFI), particularly through licensing of proprietary technology, where the multinationals' monopoly over chemical and other technologies led to indirect accumulation through royalties, licence fees, etc.

For FDI, Chandra notes a change in sectoral distribution in India over the period of 1969-80: 'In manufacturing there was a 100% rise, particularly rapid being the growth in machinery, non-ferrous metals and industrial chemicals.' (Chandra: 681)

I will not enter the debate over the importance of TNCs in Indian manufacturing[5] but it is worth drawing attention to NFI in the chemical industry. Technical collaborations or production under licence granted by TNCs have led to an increased outflow of payments through royalties, technical fees, etc. Thus TNCs prospered not through FDI but through NFI. In the period from 1981 to 1986 the annual value of these payments rose seven-fold from $65 million to $466 million. (Chandra: 681) The chemical industry internationally has been the greatest beneficiary of this trend, with 35.4% of all payments being to foreign chemical collaborators.

Similarly, while India was supposedly following a policy of developing indigenous technological capacities, this policy did not embrace all sectors, as a glance at another chemical sector confirms. 'In fertilisers the public sector engineering consultancy units which had made great strides towards indigenising technology, were side-tracked in favour of TNCs like Bechtel and Toyo Engineering in the early 1970s; since then most, if not all, large contracts went to the Italian firm of Snamprogetti as prime contractors.' (Chandra: 679) Cynics searching for explanations for this peculiar lapse might recall allegations of bribery against Bechtel, while the bribery endemic to Italian business life, particularly in the public awarding of contracts, will be recalled in the case of the Italian firm.[6]

The more recent opening up of India to foreign capital has led to multinationals queueing up to enter. Michael Eckstut, vice president of the consultants A T Kearney, notes, 'While China has captured much attention for years, India has started to appear on many chemical companies' radar screens as well.' India, he says, is attractive because its population of nearly 900 million includes an already established middle class market of 100 million to 200 million people. (*CMR* 22/5/95: SR4)

Among other sectors, Western fine chemicals companies, including Hoechst, Enichem, Gist-Brocades and Lilly, are now setting up in India, to take advantage of it as a low-cost manufacturing base. (*CMR* 7/2/94: SR22)

Other major multinationals have begun to formulate plans. Du Pont is proposing to set up five separate ventures in engineering plastics and polymers, nylon and Teflon, though given its falling prey to the burning factory syndrome in Ponda (Goa), eventual arrival of these projects is not guaranteed. Amoco is negotiating with the LNJ Bhilwara group to set up a 350,000 tpa PTA plant, involving an investment of $350 million. (*ECN* 6/3/95: 17) Hoechst plans to invest over DM800 million ($544 million) in India by the year 2000 with most of the investment going on new production sites. (*CMR* 21/8/95: 26) BASF has opened two dye plants in Mangalore, investing $34 m, while Mitsubishi opened a PTA plant in Haldia in 1999, investing $385 m, the largest single Japanese FDI project in India and also the largest foreign chemical investment in India so far. (*CEN* 17/8/98: 25,28)

One interesting development is Du Pont's two R&D alliances with Indian laboratories. In 1994 Du Pont entered an alliance with the National Chemical Laboratory in Pune to research catalysts, process modelling and polymer and reaction engineering. In April 1995, it announced an alliance with the Indian Institute of Chemical Technology at Hyderabad to undertake R&D into food production chemistry. (*ECN* 10/4/95: 23; *CMR* 8/8/94: 24; 3/4/95: 4) Cynics will dismiss this as an attempt to obtain access to cheap Indian scientific labour.

However, despite these developments, chemical MNCs have not flooded into India and some planned investment has been delayed. Thus, the major players in the expansion of the chemical industry in India so far have been local. A chemical industry journal explains, 'Many of the major multinationals remain unsure about tackling the Indian market and look to partnerships with local players for a foothold in the emerging market.' (*ECN* 6/3/95: 17)

Environmental crisis

This industrialisation policy has inevitably led to an environmental crisis. In the case of water pollution, by 1982 it was reported: 'Every major river system is polluted. Though the major part of the pollution is caused by biodegradable domestic waste, heavy metal wastes like mercury, cadmium, nickel, manganese, lead, chromium, copper and antimony have been found in rivers in Gujarat, Rajasthan, Bihar, Maharashtra, Kerala and Andhra Pradesh. All the rivers have industrial pollutants discharged into them by industries. In the Thane district of Mumbai cases of paralysis have been reported among people who have eaten fish caught from the mercury-contaminated Kalu river.' (*Ambio* 11(1): 63)

A later survey by the Central Board for the Prevention and Control of Water Pollution found that 'out of 2700 large and medium industrial enterprises, 1700 were serious contributors to water pollution. Out of the 1700 surveyed, some 353 have commissioned industrial waste-water treatment plants, 174 have plants under construction and 190 are planning to have them constructed. Thus only 717 units have or plan to have treatment facilities. This has however proved to be a gross underestimate of the actual shortfall. In March 1985 the Minister of State for the Environment affirmed that there were about 4,000 polluting industrial units in the country, and only about 200 had installed effluent treatment facilities.' (Korgaonker: 39). Another academic reported, 'Only 27% of the large and medium-sized industries have full or partial (water) treatment facilities.' (Khator: 34) More recently it was reported that, of some 9000 industrial units screened by the Delhi Pollution Control Committee, only 283 had installed effluent treatment plants. (*ToI* 11/10/95: 4)

Assessing and controlling water pollution has repeatedly been a task left to affected villagers and citizens' groups. As a result, in spite of India being a water-rich country, 70% of India's water resources are polluted. (Jayal: 25).

As to air pollution, 'While only 10% of water pollution is of industrial origin, the main sources of air pollution in the country have been identified as the thermal power generation plants, iron and steel mills, the petrochemical and fertilizer complexes, synthetic fibre factories, metallurgical wastes, chemical, ceramic and pharmaceutical industries. According to a study, steel mills and petrochemical complexes are the two biggest sources of air pollution in India.' (Korgaonker: 29)

This pollution has obviously been geographically concentrated. As one example, 'Residents of the Bombay suburb of Chembur were found to be suffering from a higher incidence of asthma, sneezing, bronchitis and breathlessness, than elsewhere in the country. This was due to the high concentrations of sulphur dioxide, carbon monoxide and particulate matter discharged by the numerous industries in the area. One fertiliser factory alone, the Rashtriya Chemicals and Fertilisers (RCF) was discharging eleven metric tonnes of SO_2 into the atmosphere every day.' (*Ambio* 11(1): 63)

Pollution's effects on health and the economy are huge. 'A 1995 World Bank study estimated that 40,000 Indians die prematurely each year as a result of air pollution, and that pollution-related health problems cost the economy $7 billion per year, or 2% of GDP.' (*BsWk* 29/7/97: 25)

Petrochemical hazards

Air pollution is only one of the hazards posed by these complexes. The massacre at Bhopal and the continuing chronicle of leaks, fires and explosions at hazardous plants signal another major hazard. A government survey in the aftermath of Bhopal identified over 7,000 potentially hazardous plants in the country, most of which are concentrated in Delhi, Madras, Mumbai-Thane-Belapur, Calcutta and the Damodar Suvarnarekha valleys.

'Nearly 70% of the hazardous units are situated in Gujarat, West Bengal, Karnataka and Maharastra,' (*Sunday*, 28/7/85: 40) while the major hazards are in Gujarat and Maharastra 'as these two states account for nearly 60-70% of the total value of output in the chemical industry.' (Kumar: 449)

In Maharashtra a study identified hazardous industries in Mumbai-Thane-Belapur, Raigad, Tarapur, Pune, Aurangabad and Nagpur. For the Mumbai-Thane-Belapur area, over forty companies deal with toxic chemicals, pesticides and incendiaries. (Karan: 199-200) Regarding Mumbai, 'It has one of the most dangerous congregations of fire, explosion and toxic hazards in the country. The city has two giant refinery installations, a huge fertiliser complex, a thermal power plant and a chain of chemical industries and pesticide units in and around its periphery. As an ILO expert grimly warned, "Bhopal has Union Carbide. Mumbai has over fifty toxic industries, and a population ten times larger than Bhopal."' (Kumar: 449)

A similar study in Gujarat found concentrations of hazardous industries in Baroda, Ankleswhar, Vapi, Valsad, Ahmedabad and Surat. (Kumar: 449)

In Delhi there are some 1500 production units that represent a hazard to the surrounding population. (Karan: 199) Similarly, following an accident in Delhi which killed nine people, the *Indian Express* noted, 'It speaks very poorly of the Delhi Administration that the rexine manufacturing factory in west Delhi was in operation in a residential area for over ten years ... Apparently, repeated pleas of the residents living in the area for the re-location of the factory were ignored by the local officials. Of course, this is not the only unauthorised unit located in a residential area. In west Delhi alone there are more than 600 factories in residential areas which pose serious threats to the safety of the people living near them and cause damage to the general environment.' (*Indian Express* 1/5/93) East Delhi is also reported to be a dangerous minefield: 'East Delhi, home to one-third of the capital's population, can any day stoke an inferno. Unrestrained and unplanned growth and no clear demarcation between residential and industrial areas, besides mushrooming of unauthorised colonies, have made the trans-Yamuna area most vulnerable to a big blaze. "The fire threat is increasing daily, with godowns of factories and industries, hoarding inflammable material, like chemicals, plastic, rubber and even gas cylinders, coming up in residential areas. Even controlling a fire in these circumstances becomes difficult," said a senior officer of the Delhi Fire Service. A fire at a chemicals factory in the crowded Trilokpuri area can spell disaster for over three lakh people residing there.' (*Delhi Times* 16/12/94: 1)

In Chennai hazardous chemical factories include units to manufacture caustic soda, alkalis and fertilizers. Most of the polluting industry is concentrated around the Adayer, Cooum and Ennore estuaries, into which some 775,000, 252,000 and 449,000 litres of metal-contaminated waste respectively are released annually. The Pallavaran suburb is the location for some forty leather tanneries, whose effluents pollute both surface and underground water. (Karan: 199)

In Calcutta and the Damodar-Suvarnarekha Valley 'hazardous chemicals and metal or mining industries producing toxic, highly reactive and explosive substances, constitute the principal manufactural units in this region.' (Karan: 200) Polluting industries include steel plants at Jamshedpur, Durgapur and Bokaro, fertilizer units at Sindri and Durgapur and an explosives factory near Hazaribagh. Along the densely populated

Hooghly waterfront in Calcutta can be found producers of pesticides, acid and chlorine, alkali, dyestuffs, paints and varnishes. (Karan: 200)

These hazards will multiply with the current phase of economic expansion. A major trend in chemical technologies over the last few decades has been the massification of hazards as plant size and capacity has increased to take advantage of economies of scale. These massification problems are exacerbated by the tendency of the chemical industry to agglomerate. The increase in capacity has led to an accompanying increase in hazard. Loss prevention and insurance industry observers, among others, have noted a tendency for the number of chemical accidents to decrease, accompanied by an increase in the devastation wreaked by those chemical accidents that do occur.

By 1987 Kumar noted the arrival of mega-hazards in India: 'One of the typical characteristics of the chemical industry is the forward and backward linkages of different types of industrial processes and activities. This has led to the emergence, and concentration at one place, of various types of industries which are interrelated and dependent on each other ... Hence the advent of oil, and its accompanying super-structure of chemical process technologies has led to the creation of mega-hazard pockets in various parts of the country. Mumbai, Baroda and Chennai are classic examples representing this new phenomenon.' (Kumar: 448) The current phase of Indian economic development is bringing with it a rash of mega-projects. As early as August 1994 *Business Today* listed 100 such projects, of which forty-two were power projects, twenty-five involved metals and twenty-four petrochemicals. (*Business Today* 22/8/94: 72)

Pollution from chemical and petrochemical complexes

We are lucky to have recent accounts of pollution from petrochemical complexes in both Gujarat and Andhra Pradesh. Saramma's exhaustive account of the spread effects of the petroleum industry in Gujarat is honest enough to include pollution from the industry as one of these spread effects. Dealing with the effect of the Gujarat Refinery, the IPCL and Gujarat State Fertilisers Co (GSFC) and the Gujarat Industrial Development Corporation (GIDC) industrial estate at Nandeswari, Saramma notes, 'The industrialisation in these areas increased the literacy of the people and the standard of living to a certain extent, but the environmental hazards due to industrial development are intolerable. Polluted air and water affected trees and plants and human life too. Crops like banana, vegetables, bajri and cotton provided huge returns prior to

the industrialisation here; but later this agricultural wealth was adversely affected.' (Saramma: 167-168)

Saramma's general conclusion on the environmental impact of the Gujarat refinery and its associated chemical and petrochemical production is worth reprinting in full:

'The concentration of various industries in one area created environmental problems. The air, water and solid wastes from these industries are proving harmful to human, animal, plant and aquatic life. Gujarat refinery is not creating any types of pollution problems at present. Its effluent water is used for cultivation. But the air pollutants from Gujarat State Fertilizers Co cause crop damage as well as health damages. About Rs. 1 lakh worth of crop is damaged in the surrounding area and there are frequent complaints of high blood pressure and asthma from the people of the area. The pollutants from Indian Petrochemicals Corporation Ltd and related industries at Jawaharnagar are harmful and the majority of these pollutants are above the permissible limit. The waste water from IPCL, GSFC, associated industries in Jawaharnagar and GIDC Nandesari are creating severe problems in the lakes of surrounding areas, and in the rivers Meni and Mahi. Even ground-water of the area is unusable. The major industries are spending large sums of money for treatment of wastes but the pollution problems have not yet been fully solved.' (Saramma: 178)

Eleven years after Saramma's report the pollution continues unabated. A more recent, and less restrained, description of the area is provided by a Greenpeace cadre: 'Though much smaller than Ankleswhar, with about 300 smaller plants, Nandesari may be even more contaminated. It is a microcosm of the toxic chlorine industry. The backbone of the complex is the Gujarat Refinery, which opened in the mid 1960s. It was followed by India (sic) Petrochemicals Ltd. (IPCL), Gujarat Alkalis and Chemicals Ltd and Gujarat Fertiliser Company. GACL makes chlorine and caustic soda, which, in turn, are used as raw materials by much of the rest of the estate. About fifty to sixty plants produce chlorine-based chemicals, including about thirty chlorinated paraffin wax plants.' (Bruno: 19)

Bruno also describes the Ankleshwar industrial estate, the largest in Asia, and its environmental effects: 'Ankleswhar consists of some 3,000 firms, about half of them chemical units, which operate in a 40-square-mile complex. Hazardous substances used in production processes and manufactured at Ankleswhar include pesticides, paints, fertilizers, dyes, and pulp and paper. The Ankleshwar Industrial Association estimates that

its members generate about 55 to 60 million gallons a day of liquid hazardous water, and about 50,000 tonnes of solid hazardous waste annually. In 1988, the state government ordered the Gujarat Industrial Development Corporation (GIDC) to develop solid and liquid waste treatment plans for Ankleshwar, but little progress has been made.' (Bruno: 18)

The situation in Gujarat is in no way exceptional, as reports on conditions at two industrial estates, Jeedimetla and Patancheru, near Hyderabad in Andhra Pradesh, show. 'More than 7000 acres of productive farmland have been contaminated with toxic chemical runoff while more than 5,00,000 people have been adversely affected, either through environmental disease or loss of traditional livelihood.' (*EPW* 17/6/95: 1419)

The first of these estates, Jeedimetla, 15 km north of Hyderabad, now contains some 500 companies. Toxic chemicals have contaminated all drinking water and agricultural wells within a 10 km radius of Ayodhyanagar, an industrial shanty next to the Vasant Chemical factory, which produces bulk drugs for US transnationals, in the industrial estate. The continuing emissions of air and water pollutants have created a public health disaster locally, as well as destroying cropland and poisoning cattle.

The industrial estate at Patancheru, 20 km east of Hyderabad, contains over 300 factories whose liquid wastes are routinely dumped in the river Nakavagu. 'One of these factories is the Voltas Chemical Company, which produces organophosphorous pesticides, some of which are banned in the West. Voltas regularly spews ethyl mercaptan, chlorobenzenes and other cancer causing chemicals into the neighbourhood air, in addition to dumping many more chemicals behind its sprawling factory site. Voltas is not alone in this practice.' (*EPW* 17/6/95: 1419)

Here again farmland, in this case some 2,000 acres, has been contaminated and thousands of cattle have died from drinking contaminated water. 'According to Kishan Rao, a local physician practising in Patancheru, there is one village in the area where all the women have stopped menstruating due to their toxics exposure ... In Sultanpur, ten families have members who have become incurably paralysed after drinking contaminated water.' (*EPW* 17/6/95: 1419-1420)

Toxic waste

A further threat is posed by the toxic waste produced by these industries, to which we now turn. Somewhat aware of this aspect of the new industries, the Indian Government notified the Hazardous Waste

(Management and Handling) Rules, which sought to control the handling and disposal of eighteen different categories of hazardous wastes. In 1992 the Indian Government effectively ratified its participation in the Basel Convention on the Trans Boundary Movement of Hazardous Wastes.

Despite these new legal initiatives, hazardous waste continued to be discharged indiscriminately by industries in the open environment and hazardous wastes continued to be imported from countries abroad ostensively for purposes of "recycling".

In 1995 the Research Foundation for Science, Technology and Natural Resource Policy based in New Delhi filed a writ petition in the Supreme Court of India asking for a ban on the import of hazardous wastes. The immediate occasion for the petition was the discovery that the Indian recycling industry was actually dumping large quantities of hazardous waste (after recovery) imported from abroad. The petition specifically discussed the case of Bharat Zinc Ltd.

Some indication of the 'sophisticated' production and disposal processes used by Bharat Zinc is given in a report by Greenpeace researcher Anne Leonard: 'In each room of the factory, workers handle the hazardous waste without gloves or real masks, although some workers tie scraps of cloth around their faces to attempt to limit inhalation of the waste dust. Apparently aware of the dangers, the plant manager provided himself and one of us with more sophisticated masks during a factory tour. Outside, men and women workers without protective clothing, and often only wearing shorts and a T-shirt, carried baskets of the residual waste on their heads and walked through the open dumping area.' (*MM* Jan96: 31)

Leonard also reports on the environmental effects of this 'environmentally sound' recycling process:

'The main environmental threats from Bharat Zinc's operations are the residual wastes left over after the zinc recovery. With the actual zinc concentration in the incoming waste as low as 60 percent, the residuals create large amounts of toxic waste which the company simply dumps behind the factory.

'Gupta states that Bharat Zinc imports and processes a total of 15,000 tonnes of waste per year. Samples of incoming waste that we collected contained over 3 percent lead. At this rate, each year more than 450 tonnes of lead from imported waste will pollute the air, water and soil around the factory.' (*MM* Jan96: 32)

After the Supreme Court took up the issue it discovered that the Government of India did not really know how much of hazardous waste was being generated within the country and how it was being disposed off. It also banned forthwith import of all hazardous wastes from abroad.

The Court eventually set up a high-powered committee headed by the distinguished Indian physicist Prof. M.G.K. Menon to examine all aspects relating to the disposal of hazardous wastes in India and to make recommendations. The Committee worked for three years and filed its report in February 2001.

The Committee made fairly detailed recommendations, the most significant of which was that Pollution Control Boards demand that companies show proof of active proposals to reduce generation of hazardous wastes when they come before the Board for renewal of licenses.

The Committee found that the international waste trade continued to import hazardous wastes into India despite the directions of the Court banning such import.

One aspect of the report was its findings that the country had few engineered landfills for final disposal of hazardous wastes and that the few small-scale units in operation in the western Indian state of Gujarat were being operated unscientifically and in violation of norms.

Due to the pressures generated by the writ petition hearings and by the constant probing of the high level committee, one State (Andhra Pradesh) finally inaugurated a large scale facility for hazardous waste and a second was being tendered for the western State of Maharashtra. But overall the situation remained dismal.

One other solution for disposal of hazardous wastes is the use of incinerators. In 1991 incinerator manufacturers Thermax Ltd of Pune received orders from Hindustan Ciba-Geigy and from Polyolefin Industries, Mumbai, for incinerators. Thermax had previously supplied fifteen incineration systems to companies in India, including Hindustan Zinc Ltd., Bayer India, National Organic Chemical Industries Ltd., Eskayef Ltd. and Sri Laxmi Paper. (*HazNews* Oct 91: 18) One snag with this high-tech 'solution' is that, in the words of one who should know, Prashant Pendse, a product manager at Thermax, 'Nobody in India operates them properly.' (*BsIn* 6/5/96: 160) The Menon Committee found that several incinerators installed for getting rid of hazardous wastes were nothing more than combustion chambers.

The import of plastic waste has also been a cause for worry. Greenpeace discovered that no less venerable a company than Pepsi exported 4500 tonnes of plastic scrap in 1993 to India. Pepsi admitted that the waste was exported but claimed it was all recycled. The company that received most of this waste was Futura Industries, in Tiruvallur, outside of Chennai. Futura's parent company is Indian Organic Chemicals Ltd (IOCL), which uses the broken-down waste in its polyester production process to lower costs.

The attack on importing plastic waste was dismissed by industry as a senseless spat. A report in one business journal reported on the safety of plastics recycling and noted, 'India has the potential to establish one of the largest plastic waste recycling industries in the world.' This industry can be fed from external as well as internal sources: 'One million tonnes of plastic waste are produced now (in India); this is estimated to go up to 2.5 million tonnes by 2000. A corresponding increase is expected in the size of the waste recycling industry.' (*Business World* 14/12/94: 96)

Further research by Greenpeace showed that Pepsico had more intensive plans to integrate India into its global reach. 'Under Pepsico's two-part scheme, plastic for single-use disposable bottles will be manufactured in India and exported to the US and Europe, while the toxic by-products of the plastic production process will stay in India. Used plastic bottles will then be returned from these countries to India.' (*MM* Sep94: 8) This involves a $25 million joint venture between Pepsi and IOCL.

Occupational safety and health

Damage by factories to the environment is never limited to damage to the external environment: it is always accompanied by hazards posed to the working environment inside the factories.

Here again we run into failure by the state, in this case even to adequately document, let alone regulate, this major problem. On official sources of information, Bhatt notes the lack of a systematic account of the incidence of occupational disease in the major industries – a situation which he attributes to 'the gross negligence of the occupational healthcare system.'

He further states that according to officials, 'there has not been a single case of occupational disease in Gujarat though 34.12% of its 4.13 crore population are industrial workers. Not a single worker has been paid compensation for disability or death caused by an occupational disease under the Workmen's Compensation Act, 1923. The Chief Inspector of Facto-

ries has not been notified about the incidence of any of the twenty-nine notifiable diseases under the Factories Act, 1948. The situation is not much better in the other states.' (Bhatt: 84) This lack of information is confirmed by epidemiologists from the Tata Memorial Centre in Mumbai who baldly state in a recent article, 'No reliable information is available on occupational cancer in India.' (Notari: 185) It is again emphasised by Knutsen in the case of the dyestuffs industry. 'Sometimes officials maintain that public documents are confidential. Occupational tests carried out by Government agencies or labour organisations are sometimes not accessible because they are considered the property of the client (factory operator). My own experience confirms this. It was impossible to get any information whatsoever on occupational safety in the dyestuff industry from the Central Labour Institute, which is a public body.' (Knutsen: 203)

Despite the official negligence, some shocking estimates have been prepared by unofficial sources: 'From the data of deaths and injuries reported under various Acts such as the Factories Act, the Mines Act, and the Workman's Compensation Act, it may be estimated that for every 1,00,000 workers, as many as 7,000 may be injured every year, while seventy-five die. For a total workforce of 20 crores that means about 1,50,000 deaths are recorded every year.' (Roy: 76)

One example of occupational injuries may be cited here. In July 1993 it was reported that ten workers at an aluminium plate factory in Ambad, MIPS, Nasik, run by Niray Graphics were admitted to hospital in Satpur. The hospital found nine workers suffered from azoospermia (lack of sperm in their semen) and the tenth to have a very low sperm count. This may be due to exposure to chemicals at work, including methyl cellosolve, ethyl cellosolve and diazole. (*WHIN* 39: 6)

It is important to emphasise that hazards are in no way confined to the chemical industry. A useful example is provided by the tanning industry. Nihila notes, 'There has been an increase in the number of chemicals used in tanning, now nearly 225. Of these, quite a few are toxic like sodium sulfide, sulphuric acid, ammonia, acetic acid, chromium, formaldehyde, etc. Prolonged contact with these chemicals leads to dermatitis, conjunctivitis, nervous disorders, itching of skin, throat, mucous membranes, chest pain, asthma, bronchitis, ulcer, fissures in arms, nose, mouth, feet, etc.' (Nihila: 1485)

The tanning industry is also characterised by a dual workforce, or a segmented labour market, with the marginal workforce facing the most

severe hazards. 'In Dindigul, where we have conducted an extensive survey, only about 35 to 40 percent of the total workforce are covered under some labour welfare scheme or the other. The rest of the workers are not even recorded as employees.' (Nihila: 1485)

No prizes for guessing that the most disadvantaged workers are women and that they are the ones who bear the brunt of the industry's toxic burden. 'Women are employed in large numbers in the tanning industry ... The work done by these women workers is the most hazardous part of the entire tanning process. Further, these women neither form part of the workforce reported under the Factories Act nor are they included in official statistics.' (Nihila: 1485)

If the situation is bad at present, it is expected to get a lot worse: 'With the unfolding of the New Economic Policy there are good reasons to fear that the occupational health hazards will worsen. The employment opportunities are shrinking in the organised sector. This will result in thousands of potential workers fighting for fewer jobs and thus becoming less able to defend themselves against hazards introduced by new technologies.' (Roy: 80)

Government regulation: Designed to fail

The most recent phase of Indian environmental regulation began in 1972 when the National Committee on Environmental Planning (NCEP) was set up. While Indira Gandhi proudly proclaimed at the UN Stockholm conference that poverty was the worst form of pollution, she was shrewd enough to know which way the wind was blowing and initiated a government programme on environmental issues. Following NCEP the Central Board for Prevention and Control of Water Pollution appeared in 1974. By 1980 the environment had moved further up the bureaucratic ladder with the formation of the Department of the Environment, which was elevated to ministry level in 1985 when the Ministry for Environment and Forests (MoEF) was established.

Legislation also appeared, with the Water (Control and Prevention of Pollution) Act being passed in 1974, the Air (Prevention and Control of Pollution) Act in 1981 and the Environment (Protection) Act in 1986. (Khator: 23) In March 1992 India made an environmental audit report mandatory for all industries covered by the Air and Water Pollution Acts and the Hazardous Wastes Handling Act. Given that these reports were to be submitted to the already overloaded and understaffed State Pollution Control Boards, the effect was most likely to be cosmetic. (Reich: 649-650)

Establishing institutions and passing legislation is no guarantee of anything, as our survey of Asia to date has clearly shown. This can be seen in the lack of power of MoEF vis-a-vis other, stronger sectors of the Indian bureaucracy: 'Because of MoEF's relatively low power in the bureaucratic hierarchy other ministries have little incentive to pay attention to the environmental consequences of their policies and the MoEF has not been able to influence other ministries' policies that are likely to have environmental consequences.' (Reich: 653)

It can be argued that many peripheral countries have adequate legislation but implementation of this legislation is faulty. In India, not only is implementation faulty, but so is legislation. In relation to water pollution, 'Implementation of the Water Act and its subsequent amendments however has been largely ineffective, due to various factors: insufficient funding of State Water Pollution Control Boards, the lack of a private right of action, and the lack of expertise for analysing and managing the water pollution from various industries ... Loopholes in the law have allowed offenders to escape with impunity from prosecution by the Central Water Pollution Control Board. In addition, the Act does not provide government authorities with the power to close facilities that violate the regulations. In short, for polluting firms, the cost of compliance has exceeded the cost of noncompliance.' (Reich: 646)

Another lacuna in the legislation is that 'The laws, similar to the environment-related laws of Great Britain, relied on voluntary compliance and established no time schedules or emission standards, and left no scope for litigation.' (Khator: 24)

Indeed cynics who suspect that Indian government environmental regulation was designed to fail have much evidence to back up their suspicions. Khator noted that the 1981 Air Pollution Act 'was meant to be toothless.' (Khator: 73) The most obvious proof of this is that 'responsibility for implementation was assigned to the Water Pollution Control Boards, thereby exacerbating their problems of inadequate finances and expertise.' (Reich: 648) Having failed to control water pollution, the Boards were given the additional responsibility of failing to control air pollution.

Other environment industry observers concur with this picture of inadequate enforcement: 'One major problem is the lack of enforcement of existent regulations. One of the main reasons for this is the lack of financial resources and incentives, both in the private and the public

sector. Because of this deficiency of funds and of qualified personnel, the government of the seventeen most pollutive industries and the carrying out of obligatory environmental audits is inadequate. Legally prescribed monitoring intervals are rarely observed. Penalties in the forms of fines or charges in the event of non-observance of limit values are set forth in pertinent acts, but the fines are relatively modest, and they are rarely collected.' (*EBB* 305: 9) Policy researchers have pointed out another lacuna: 'India's current policy does not include any mechanisms to assure that pollution control equipment is operated regularly after installation. Consequently, many firms turn off pollution control facilities at night or during power shortages.' (Reich: 651)

The Indian state ensured its environmental regulation would remain irrelevant through bureaucratic sleight of hand and the use of the division of responsibility between state and central governments. Thus responsibility for environmental regulation was placed with state governments, which had neither resources nor inclination to undertake the task zealously. The major reasons for the failure of state boards are easily summarised: 'Most state boards lack the necessary technical expertise and facilities, staff, funding and power to accomplish the intended goals of pollution control.' (Reich: 654)

Regarding funding, Khator notes, 'State boards suffered from financial crunch as well as from political manipulation directed by state governments and by the Central Board. In 1979, most state boards had fewer than fifty staff personnel, and their total budget varied between Rs. 2,000 and Rs. 350,000 (approximately between $200-$3500 at that time's exchange rate of 1: 10). Their budgets increased significantly in later years; nevertheless, compared to their responsibilities, the budgets were always inadequate.' (Khator: 71)

The Central Pollution Control Board (CPCB), established in 1988, is also a powerless body. Theoretically its responsibilities include coordinating the functioning of the state boards, providing technical assistance and guidance, initiating investigation and research, planning and organising training of staff, collecting and publishing technical data, etc. However, according to a 1992 report of the Comptroller and Auditor General, the CPCB is not vested with the powers to discharge its responsibilities, as the state boards are not required to consult the CPCB nor to comply with the standards that have been set. 'The CPCB cannot take over the activities of the state board if the latter defaults. The ministry notifies standards in consultation with the state boards, and not the cen-

tral authority.' The CPCB is also understaffed: in 1994, 21% of its supposed technical staff establishment was unfilled. (*EPW* 8/10/94: 2637-2638)

The bureaucratic paralysis was near perfect as both state and central governments could blame each other for the continuing failure of environmental regulation: 'In fact the arrangements under the environmental policy created a double protection shield for governments – state governments could protect themselves by accusing the central government for failing to provide adequate funding, while the central government could pass the blame on to state governments for failing to implement laws.' (Khator: 114)

Finally with regard to regulation, we should note a problem relating to industrial structure: 'India's industrial structure includes many small firms (both unorganised and household units) that lack adequate capital resources, physical space and skills needed for designing pollution control systems ... In the state of Andhra Pradesh, for example, there are 700 large and medium-size factories and about 70,000 small-scale manufacturing units.' (Reich: 652) About one third of India's manufacturing output comes from small workshops. (*FT* 30/3/94: 18)

If on one hand the Indian government answered the environmental crisis with a spectacular regulatory apparatus, on the other hand it often answered environmental organisations with the iron fist: Human Rights Watch has noted, for example, that state activity against anti-Sardar Sarovar activists included 'arbitrary arrest, illegal detention, beatings and other forms of physical abuse'. (*Human Rights Watch*: 21) Such examples of state repression are legion, including the use of the Official Secrets Act and murder charges against activists in Bhopal.

A more recent example was provided by the campaign against Du Pont in Goa in 1994: 'The state government arrested the top leadership of the anti-nylon movement, using the Terrorist and Disruptive Activities Act,' a senior bureaucrat admitted to the *Financial Times*. (13/3/95: SuppVII)

Industry response

Industry has displayed the same contempt for environmental regulation that the state has. 'Defiance, rather than compliance, has been the strategy of the mighty industry ... the image of officials as being susceptible and vulnerable allows the industry to ignore emission control guidelines. It is believed that officials can easily be "bought" and, there-

fore, it is cheaper to buy off a regulator than to comply with regulations.' (Khator: 108). Similarly, on cost grounds, 'the payment of fines (which is not drastic) or going through litigation (which process may drag for several years while the company continues its operation) is viewed as cheaper than installing a treatment facility.' (Khator: 110)

One example of industry defiance is provided by the case of Century Rayon. On 17 March 1993, nine residents of a *basti* in Dhakta Shahad in Thane died and some 40 others were hospitalised, after exposure to toxic fumes from the nearby *nullah* that carried effluent from the Century Rayon viscose filament plant. In an echo of Bhopal the chief medical officer of the Century Rayon hospital said that most of those admitted were suffering from pulmonary oedema. Some 120 tonnes of sulphuric acid and other chemicals was released into the *nullah*, where it combined with carbon disulphide from another effluent stream to release carbon disulphide. The following day four top officials of the company, which accounts for over 30% of the turnover of Century Textiles, a Birla Group company with a turnover of Rs. 1,099 crore in 1991-1992, were arrested and later released on bail.

The company's attempts to evade blame were unsuccessful. 'A team of experts from the State Pollution Control Board, accompanied by officials from the central Environment Ministry, visited the site last Sunday, have reported gross negligence by the factory managers. The safety rules were not being followed by the factory. The warning signal to alert those living close to the factory did not go off for a whole hour after the accident by which time 120 tonnes of sulphuric acid had gushed out of the factory into the *nullah* outside ... There were no safety or emergency lights when the accident occurred ... There was no expert on site to cope with the emergency and no one of authority to even inform the state pollution control board about the accident.'[7] (*Indian Express* 2/4/93)

Following an order to close the factory, Century Rayon mobilized the trade unions and the weavers' association to argue that closure would cause unemployment, given that 40% of India's viscose rayon is manufactured by Century. Thus, 'ten days after Environment and Forest Minister Kamal Nath directed Maharashtra Government to close the Century Rayon unit at Shahad Kalyan ... the factory continues to function defiantly.' (*Indian Express* 2/4/93)

This policy continues: 'In 1995 the Gujarat High Court ordered the closure of 756 industrial units in Vatva, Narol, Naroda and Odhav, ask-

ing them to compensate the villages affected by pollution through discharge of untested effluents. Many of these units are operating even today and are still polluting.' (*DTE* 15/4/00)

Regarding the controversies and protests over pollution at Mavoor and Amlai, Khator noted: 'I was told during my interviews that, at the time of the annual inspection, government inspectors were often brought in luxurious company cars, were given the finest hotels to stay in and were honoured in elaborate receptions. In addition, direct or indirect cash bribes were also offered. Inspectors, earning less than the socially accepted wages, found the temptation hard to resist.' (Khator: 166-167) The companies also attempted to bribe communities by donating temples or community halls or by providing other facilities. (Khator: 166)

While one hand offered bribes, the other threatened: 'When prosecuted, private companies sometimes threaten to shut down the factory rather than install pollution control measures. Then the Government immediately relaxes the pressure because it needs the industry for economic expansion.' (*Ambio* 11(1): 64)

Resistance to toxic development

Given the environmental effects of Indian development policy, growth of an environmental movement was inevitable.[8] Opposition has sprung up to dams and other power generation projects, industrial projects, mining, commercial fishing and aquaculture, nuclear projects and army firing ranges, forestry and tourism projects, much of it centred around displacement of the original inhabitants of the lucky areas chosen for development. The number of environmental groups in India has increased by 600% from 1963 to 1983, when some 250 environmental groups were registered. (Khator: 175) By 1985, 600 environmental groups were registered and this grew to some 12,000 groups by 1997. (*BsWk* 29/9/97: 25)

Popular response to pollution damage began as early as 1958, when the Birla-owned Gwalior Rayon unit at Mavoor, Kerala, opened. Pollution of the nearby Chaliyar river by the factory led to a rapid increase in skin diseases and to cattle losses. Throughout the 1960s the local population, mainly agriculturalists, organised protests against the pollution, protests which ceased only when the company promised to install water treatment facilities. Finally in 1974 the Kerala Pollution Control Board, which had just been established, investigated the case and company officials agreed to build a pipeline to discharge the waste to another water body. When this was not done within another five years, local protests

turned violent in 1979. In response the company finally laid the agreed pipeline. But, according to Khator, 'It was a poor job, leaking effluent throughout its length, and the effluent was more toxic now because waste water treatment had been virtually stopped.' In 1979 government authorities also found mercury pollution in the Chaliyar, and two years later the Kerala Pollution Control Board finally took legal action against the company. (Khator: 22)

Other protests also arose in other parts of India. In 1967 fish and cattle started to die at Amlai in Madhya Pradesh, two years after the Birla-owned Orient Paper Mills commenced production. Villagers from some twenty-five villages became involved in the agitation, as well as complaining to government authorities, who did nothing. The company agreed to install a water treatment plant, but fish and cattle deaths still continued.

In 1973 Zuari Agro Chemicals (owned by the Birlas but with US Steel involvement) began production in Goa and within two years cattle and tree deaths were reported. Villagers formed an Anti-Pollution Committee, organising a massive rally in March 1975. In the same year, the company was forced to install another waste treatment plant and pay compensation to affected villagers. Again this did not resolve the issue. As a recent citizens' report on the Goan environment notes, 'In spite of forced closure of the plant by the court and taking of several remedial measures, air pollution has continued, though to a lesser extent.' (Ecoforum: 216)

Other major campaigns during the 1970s included opposition to the Mathura oil refinery (based on fear of air pollution damage to the Taj Mahal downwind) and to the RCF fertiliser factory at Mandwa/Rewas in Maharashtra. Both of these campaigns were attacked as middle class, though the latter had some popular support. (D'Monte) Other examples include the decision by farmers from the constituency of the former Minister of State for the Environment, Begoyay Pratap Sinh, to boycott the 1980 election due to pollution of the river Falku by effluent from the Dharangandhra Chemical Works, (Khator: 179) while in the early 1980s the NGO, Concern for Calcutta, prevented the commissioning of a zinc smelting plant which had been sited in the heart of the city without prior sanction from the state environment department. (*Sunday* 26/7/85: 44)

Following the massacre at Bhopal, opposition to toxic production strengthened, with Praful Bidwai noting in 1986, 'There is a great deal of

organised opposition to the siting of hazardous factories. That's true of Kerala, Gujarat, Karnataka.' (quoted in Jones: 146) 'In October 1987, farmers and fisherfolk from the Devananda creek area of the Raigadh district protested against the discharge of effluents from forty units operating in an industrial area owned by the Maharastra State Industrial Development Corporation. Accusing the MIDC of not treating effluents before discharging them into a nearby river, peasants jammed a wooden log into the discharge pipeline. Some months later, villagers in Ahmednagar district of the state united to oppose the pollution of land and water by the discharge from South Asia's largest distillery.' (Gadgil: 117-118) The Harihar Polyfibre factory in Karnataka and the proposed NOCIL/Shell petrochemical plant on the west coast also faced stiff opposition from local environmental groups. (*FT* 19/12/92: 10)

India has also seen the development of legal struggles against pollution: 'Over a thousand cases were filed against violating organisations and individuals in the last decade alone.' (Khator: 22) On 1 May 1995, for example, fifty-nine tanneries in North Arcot district of Tamil Nadu were served notices of closure by the Supreme Court following their failure to implement effluent controls. (Nihila: 1484) While there have been some victories, overall legal struggle has shown great limitations. While there have been innovatory judgements and judicial activism, it is fair to say that the legal system has provided limited redress. As just one example, environmental advocate Norma Alvares has detailed years of litigation in the case of Zuari Agro Chemicals with little beneficial result.[9] (Alvares: 14)

Continuing and strengthening opposition

A recent academic observer notes, 'Environmental awareness among the people and the government is now being cited as a major factor in making India a less appealing place for foreign investors.' (Khator: 180) In September 1993 Cargill abandoned plans for a $30 million salt works in Gujarat state. George Fernandes, who was vocal in the campaign against the project, said, 'We have proved that by following Gandhi's method of concerted non-violent peoples' action, it is possible to defeat the combined power of the multinationals and the government.' (*Econ* 16/10/93: 61)

In 1995 *Business India* highlighted the growth of opposition to toxic developments in the Konkan belt, comprising Thane, Raigarh, Ratnagiri and Sindhudurg, along the Maharashtra coast. Although the area is ideal

for the development of horticulture, it has been chosen by Maharashtra state for locating chemical industries. Among the big projects already located there are the Rashtriya Chemical Fertilisers (RCF) factory at Thal Vaishet, Hindustan Organic Chemicals and IPCL at Raigad, and Bombay Dyeing at Patalganga. The RCF was the object of a major environmental campaign in the 1970s.

Maharashtra is a useful example, not only because of the depths of public opposition but also because Maharashtra, along with Gujarat, has been the target of choice for FDI. In 1994 Maharashtra approved $1.19 billion of FDI, over a quarter of all FDI approved in India that year. Some $30 billion of investment has been approved by the state since the 1991 reforms, $7 billion of which has some foreign component or participation, compared with Gujarat where $23 billion has been approved. (*FT* 19/6/95: Supp1)

These approvals are granted despite the promise of adverse environmental effects. One recent example involves permission granted by former Maharashtra Chief Minister Sharad Pawar, in the last days of his administration, to the Indonesian multinational Sinar Mas to set up a Rs 650 crore paper plant in the Chief Minister's home town of Baramati. Unkind commentators have suggested his son-in-law's employment by Sinar Mas was responsible for his expediting the project. In any case, the project was approved despite nineteen detailed objections being laid against it by the State Pollution Control Board and the failure to plan new facilities to provide for the project's demands for water. (*Indian Express* 10/5/95: 5)

Meanwhile, villagers in Anjanwel, where the Rs 9,500 crore Enron power project was planned, began a total social boycott of 'undesirable' outsiders associated with the Enron project. Among other problems associated with Enron, the company failed to submit a required evacuation plan, something the Indian government overlooked, hungry as it was for Enron's dollars and megawatts. 'It's scandalous to clear a project without a disaster-management plan. This is creating conditions for another Bhopal,' Bittu Saghal of *Ecologist Asia* said. (*Newsweek* 12/12/94: 22) Villagers feared that effluent from the plant would destroy their fisheries and kill coconut and mango trees. In May 1995, hundreds of local villagers stormed the plant's construction site, injuring many of the 1,500 construction workers on site, including three of the sixty foreign advisers, and destroying petrol pumps, furniture and office records. Mahmood Ibrahim Mastan of Anjanvel village said, 'There were election promises

that the project would be stopped. The papers started talking about pollution in the area and people heard they would have to leave their homes. They said, "Why not remove them before they remove us?"' (*MM* July95: 14)

Thus opposition to Enron embodies the precautionary principle. 'Local fishermen and farmers feared the project would damage the ecology of a region that is famous for its mango crop and the soaring flight of white-bellied sea eagles, an endangered species. Says Debi Goenka, a leading environmentalist in Mumbai, "Enron is like the camel's nose in the tent. Before you know it, other factories will follow, and this fertile agricultural belt will become a polluted industrial wasteland."'[10] (*Time* 26/6/95: 67)

In the Sindhudurg region, where Rs 247 crore worth of investments are proposed, residents have formed a *samiti* (committee) to protect the area's environment. In Jaigarh, Ratnagiri, local agitation forced MIDC to abandon development plans for the area, involving a Rs 700 crore copper smelting project proposed by Sterlite, which was accused of proposing to use second-hand machinery.

In December 1994 residents of four villages in Khed taluka of Ratnagiri district challenged the acquisition of land in their area by MIDC for an industrial zone in the Bombay High Court: in response the court issued a series of pollution control directives to MIDC and to the Maharashtra Pollution Control Board. (*ToI* 18/12/94: 5)

Dr G G Parikh, a long-time activist with the Yusuf Mehrally Centre, explains the change in the situation since the campaign against the RCF Thal Vaishet project: 'In the early 1970s when the Thal Vaishet project was proposed to come up near Alibagh, many environmental groups opposed it. But the project came up nevertheless because people, not yet aware of the dangers, wanted it. Now the situation has changed and people are well aware of the dangers, and they are also kept informed by the voluntary agencies.' (*BsIn* 5/12/94: 147)

This new wave of opposition is understandable considering the environmental damage in the Raigad district caused by existing plants operated by major companies such as Hindustan Insecticides, Hindustan Organic Chemicals and Lona, in particular to the Patalganga river, with reports of water near the village of Apte reeking of chemicals, while the previous history of MIDC gives justifiable cause for alarm.[11] Other problems include deforestation caused by air emissions and major fish kills

which have led to the economic base of many fishing villages being virtually wiped out. 'River water pollution is a serious health hazard too. Residents of Apte and Sarva complain of a constant throat and lung irritation. During morning hours visibility in the villages is almost nil and there are breathing difficulties owing to a heavy smog. Epidemics and hitherto unknown diseases are breaking out in the villages. Once an epidemic breaks out everyone denies responsibility or accuses each other, for the helpless public have no scientific monitoring system to identify the culprits. Some of the local doctors of the area are of the firm conviction that the river Patalganga has become the main source of many ailments of many people.' (Chadha: 1574)

In vain, public protests have been made since the early 1980s: 'The agitation began way back in the early 1980s when the doctors at the centre suddenly had an influx of people suffering from water-borne diseases and epidemics. On further investigation it was found that pollution of Patalganga river may have been the reason for these health hazards. Social activists took up the issue and organised the villagers to fight for their survival.' (Chadha: 1575) It took nearly a decade of agitation for any result to become visible: the state government proposed that industries in the Konkan belt area would cooperate to finance an effluent treatment plant. Instead the Patalganga Rasayani Industries Association constructed a water pipeline for the affected villages. This technical fix, which avoided dealing with the main problem, has been unsatisfactory, given lackadaisical construction practices leading to pipeline leakages and flooding, rather than irrigation, of fields.

Given this experience of pollution, and the failure of popular agitation to force the state or industries to deal with the problem, it is no surprise that residents have decided that the way to prevent pollution is not to regulate emissions from industry, but to prevent polluting industries from setting up in the first place. This shows a sophisticated and hard-won appreciation of the *precautionary principle* by local residents.

Business India considers what is going on in the area to be a new development whereby the accepted model of development is being rejected by local residents: "For too long, development ... synonymous with big, has sought to awe the people with size, promising everybody unlimited hypothetical goodies for an unlimited period. At the macro level, this has always worked out to mean that the government barges in, chooses an extensive area for development, displaces the local population, sets up factories and plants, disrupts the old rhythm of life, pollutes the envi-

ronment, upsets the ecological balance of the region – all in the name of progress and development. For many decades after independence, this model has been unquestioningly accepted and followed ... What is happening today – and this is a new development – is that people are increasingly beginning to look askance at the model and question its *raison d'etre*.' (*BsIn* 5/12/94: 146)

A different kind of burning factory: Du Pont in Goa

This same questioning attitude to development, allied with local experience of polluting industries such as Zuari Agro Chemicals, lies behind the long and ultimately successful campaign against the proposed Du Pont/Thapar Nylon 6,6 plant in Goa.[12] The year after the Bhopal massacre, Du Pont announced plans to invest over $150 million in a Nylon 6,6 plant in Ponda, Goa. Du Pont got involved with the Thapars group, and arranged for cut-price land, electricity and water supplies. Following Du Pont's development of an improved substitute for Nylon 6,6 called Hyten for core countries, it looked towards peripheral countries for continued sales of Nylon 6,6. Du Pont's original plan was to export its production plant from its Richmond, Virginia location but, following criticism from India and Du Pont shareholders, the company announced it would build a plant involving 'latest state-of-the-art technology'.

The local opposition criticised 'the potential runoff of wastes from the plant into the farmers' fields; into the region's major source of drinking water, the Opa waterworks several kilometres away; and into the nearby Madei river, which supplies a large proportion of residents with fish, a primary source of food.' (Schapiro: 501) Activists also pointed to a clause of Du Pont's agreement with Thapars which stated that Du Pont and its representatives will be 'harmless from any claims made in the Republic of India against representatives of Du Pont or its assignees alleging bodily harm or death sustained as a direct result of, or in direct connection with, the performance of this Agreement.' (Schapiro: 500)

While this clause showed Du Pont had learned from Bhopal, it was not the only group that had learned the lessons of Bhopal. The Anti-Nylon 6,6 Citizens Action Committee (ANCAC) organised a wide alliance involving local farmers and craftworkers, students, intellectuals and environmentalists. The ANCAC obtained much information from the US on Du Pont's environmental and occupational health and safety record, as well as specific information on the toxic hazards associated with Nylon 6,6 production.

While Du Pont responded to the opposition by hiring a local PR company, the opposition continued to grow and in November 1990 the local villagers stormed the site in protest at Du Pont's plans. The state government responded by beginning a study of the factory's environmental and economic impact. In autumn 1991 local village elections returned representatives opposed to the project. In November 1991 residents armed with sticks and torches stormed the site again, burning down such buildings as had been erected. In response, the government froze construction of the factory. Du Pont responded by 'threatening to relocate the plant to a more receptive state in India, or even elsewhere in Asia'. (Schapiro: 501)

Instead, Du Pont stuck with the project and it was not until January 1995 that the expression of people power forced the retreat of Du Pont from Goa. At this stage capital's agents of coercion were strongly in evidence: 'By November 1994, tensions in the area had created the atmosphere of a showdown. Police vans parked along the narrow roads leading into Keri and Savoi-Verem villages. TDL hired more than 75 security guards to camp out at the factory site. Meanwhile, local village men guarded the entrance roads to the site and monitored any outsider coming to the area to work on the project. Villagers also instituted a total boycott of the project.' (Cohen: 24)

On 16 January 1995 over 500 villagers marched in the state capital calling for cancellation of the project. The following day activists dug trenches on the access roads to the site preventing vehicles from entering the site, thus stalling construction work. Three activists were arrested and beaten up by the police, but when news of the arrests spread, over 1200 people gathered at the police station and forced the release of the activists. Continuing protests mounted towards an inevitable confrontation. When the confrontation came, it was Du Pont that sparked it:

'On the morning of 23 January, a busload of US Du Pont officials, accompanied by three police jeeps, were met by seventy protesters, mostly women and children, sitting on the road leading to the factory. When the women refused to let the bus pass, police advised the Du Pont officials to return to the state capital Panjim. In Panjim they met with Chief Minister Rane and demanded that more aggressive action be taken against the activists. By 4.30 pm, two busloads of police returned to the scene. According to eyewitnesses, the police opened fire without issuing a warning to disperse.'

'Nilesh Naik, age 25, was shot in the chest, while others received minor injuries. The villagers retaliated by burning one police bus and three jeeps. Naik died soon after admission to a nearby hospital.' (Cohen: 25)

In response the Citizens Committee called for a general strike in the area, including the nearby city of Ponda. The following day the activists and their supporters took over the city of Ponda and the company's offices were ransacked and files and office equipment were burned. The next day a funeral procession bore Nilesh Naik's body through the city to the factory site where it was to be cremated. By late afternoon some 4000 people were present at the site, which had been vacated by TDL's security force on advice that their presence would provoke violence.

'Many prominent Goans spoke at the funeral service, standing on a platform made from the dismantled factory signboard. Naik was praised as the first martyr of the Goan environmental movement. The crowd renamed the plateau in his honour. But before Naik's pyre was lit, a large explosion went off at the factory site and a huge billow of smoke rose from the TDL administrative complex, where an electricity generator had been blown up.' (Cohen: 25)

Following the death of Nilesh Naik, a Du Pont spokesperson said, 'It is important for Du Pont to understand what is the real cause of the problem in India. It may not be environmental concerns, but instead may be something else, such as internal politics in Goa.' (*CMR* 30/1/95: 22)

Notes

(1) For sources on Indian economic liberalisation see *BsWk* 30/1/95: 38-41; 29/4/96: 36-40; *FEER* 6/4/95: 74-81; *MM* July/August 95 (full issue). For useful background see Chapman, G, 'Change in the South Asian core' in *The Changing geography of Asia*, Routledge, pp.10-43.

(2) For sources on the Indian petrochemical industry see *ECN* 6/3/95: 16-17; *ECN* 3/5/93: 16-21; *ECN* 3/4/95: 18-19; *ECN* 10/5/93: 15-16. *HP* Aug1977: 56-*Guard* – 56-L *Business India* 10/5/93: 52-60; *HP* May94: 52-53; *APC* Nov94: 32-37,27-30. For a highly critical account of petrochemical development in India see Auty, R M (1994) *Economic development and industrial policy*, Mansell, pp.183-205.

(3) See also *CEN* 5/7/93: 9-11; *ACN* 4/9/95: 6; *FEER* 11/5/95: 66

(4) *Econ* 25/7/98: 70; *BsWk* 25/6/01; for further criticism see *BsWk* 20/11/95: 58-59 and *WSJE* 22/4/96: 1,5.

(5) For an introduction to the debate see Chandra (1991). See also Greer, T (1996) *TNCs: an activist's guide to research and campaigns on TNCs*, PIRG.

(6) Information on the development of indigenous technology can be found in *EPW* 13/5/89: 1059-1064; 19/4/86: 698-705; 18/2/84: 287-304.

(7) Alas, previous experts had appeared to find no problem with the plant. 'It is telling that while the last visit by a member of the Board was as recent as February 1993, no adverse reports were given or significant recommendations made.' (*BsIn* 29/3/93: 127)

(8) Accounts of environmental action in India include Agarwal, A (1989) *The fight for survival*, CSE; Baviskar, A (1995) *In the belly of the beast.*, OUP; Omvedt, *Guard* (1993) *Reinventing revolution*, M E Sharpe. *Ecol* 19(3):111-117; *Race and Class* 28(4):29-38; *Asian Exchange* 6(4):49-74

(9) On the failure of the legal system in the context of the most notorious environmental pollution in India see *EPW* 18/11/95: 2907-2909. On legal strategies and trends see *MM* July/Aug 95: 29-31 and Environmental Policy and Law 23(2): 102-108

(10) Most of the controversy over Enron is outside the scope of this book. Among other sources worth checking are *EPW* 17/6/95: 1441-1455; *FT* 20/6/95: 23; *FEER* 5/10/95: 82; 1/2/96: 54; *WSJE* 28/4/95: 1,6; *BsWk* 22/1/96: 18; 4/9/95: 18-19; *MM* July95: 14-17; *Ecol* 26(4): 179-184; *Indranet Journal* 3(2/4); *Newsweek* 31/7/95: 40-41; *BsWk* 19/6/95: 76

(11) On this see *Bulletin of Concerned Asian Scholars* 26(3): 33-44.

(12) This account only scrapes the surface of the Du Pont saga. For more, see Third World Network Features 1300/95 and 1281/94; Alvares, C (ed) (1991) *Unwanted guest*, Other India Pr; *MM* March95: 23-26; Schapiro, M (1992) and *BsWk* 27/3/95: 20

12

Resisting toxic development

Only a fool would claim to have discovered an Asiatic mode of toxic production, but certain similarities across the Asian continent arise almost blatantly in the material this book examines. These similarities are expressed in effects on community and worker health arising from a common cause: enthusiastic and uncritical promotion of industrialisation by authoritarian regimes, often military, often corrupt, always limiting freedom of information and often limiting freedom of political organizing. These similarities are not the result of any Confucian conditioning but the result of strategies shared by capital and state in the current phase of Asian industrialisation. They result from strategies of primitive accumulation and super-exploitation of labour and the environment.

This concluding chapter will deal with more strategic issues; though all its generalisations may not (cannot) be true in every case, many often are. We will begin with the industrialisation project itself, showing it to be the result of an alliance between capital and state, and examine the nature of the state involved. We shall then note the toxic nature of this development project, as well as the failure of the state to deal with these toxic effects, and end by commending Asia to the hands of its inhabitants whose action *for* life, and *against* toxic development is the only force that stands between the continent and eventual ecocide.

Alliance between state and capital

Those who believe that the economic, ecological and often literal rape of Asia currently underway is due solely to MNCs are sadly misguided. It is obvious at this stage that the project of industrialisation was a joint venture between the local state and global as well as local factions of international capital. Local capital and state have shown as great an eagerness to sacrifice their country and people to industrial development as has any MNC.

Similarly those who explain the Asian environmental crisis as a result of the export of hazard are equally misguided. (This is, in fact a variation on the 'It is all the fault of the MNCs' theme.) What is happening is not simply the export of hazardous production from core to peripheral countries (or, from the North to the South, as hazard export theorists term it) by MNCs responding to government regulation won by the environmental movement. Rather, toxic technology is being developed in and transferred to peripheral countries as part of the general industrialisation process in these countries. Nor, in many cases, including some critical ones, is this toxic development being driven by MNCs: in many cases national capital, especially state capital, has been the motive force.

A significant alliance with the local elite and the local state is essential to the success of toxic capital's projects. The acceptance of a pro-development ideology by peripheral states and elites means that exploitation by MNCs is welcomed and facilitated by local states, as these states obtain political legitimacy through economic development. This has been done through the creation of EPZs where no regulations apply, through the failure to regulate toxic hazards, through the physical removal of people from areas given over to MNCs, and through repression of the struggles of both workers and local communities.

The establishment of capitalist relations of production has been the main aim of the development policies pursued by the Asian states over the past three decades. This development involves the industrialisation of agriculture along with industrial development itself, and the destruction of pre-capitalist forms of organisation and subsistence.

One major role played by the peripheral state for transnational capital has been the maintenance of industrial and social peace so that investments are not threatened. This includes the use of police and mili-

tary force to respond to a wide variety of popular opposition, ranging from strikebreaking to actual physical removal of people from their lands to extermination when required. In many cases, development proceeded parallel to and at the same time as the process of nation-building.

The strong state

If the first public secret of Asian economic dynamism is state guidance (i.e. state capitalism), the second public secret was the nature of that state. Central to wresting the Asian miracle off the backs of Asian labour was the strong state. Exponents of the East Asian miracle cure for developing economies generally omit to point out that this miracle occurred under martial law conditions, preferring such cultural explanations as the influence of Confucianism. In those countries that developed into tigers the struggles of communists and workers were defeated and their organisations repressed: capital advanced behind the bayonets of the armed forces.

The army was essential, in the first place, to hold territory for capital and to expropriate/appropriate other territory for capital – taking it by force, if necessary, from its original (and often aboriginal) inhabitants, fuelling the area's primitive accumulation. Here examples vary from the Penan in Sarawak through the Indonesian colonisation of East Timor and West Papua to the Burmese attack on the Karen and other tribal groups. The forces of the state were also necessary to enable capital to keep what it holds, in the final analysis, by coercion.

In most cases capital was protected by not just a strong state but a national security state. In East Asia, industrialisation proceeded during the 30 years in which, in Chomsky's phrase, the US was at war with Asia, otherwise described as the war against communism. Thus Japan's development was kick-started by the Korean War, and both Korea and Taiwan benefitted from American aid to keep them safe from communism, just as they benefitted from the war in Vietnam. This war produced similarly dubious economic benefits for the Philippines and Thailand, for playing their roles as brothel and floating aircraft carrier. The availability of the Korean Central Intelligence Agency (KCIA) to maintain labour control was of no small benefit to Korean capital; similar examples may be cited. This military involvement is not always confined to disciplinary matters: the problems involved with militarisation are often further complicated by the involvement of the military in economic activity.

Contrary to much globalisation rhetoric, this book shows that the role of MNCs in Asian economic development was much less central than the role of the state, which has been characterised as a developmental state. These Bureaucratic Authoritarian Industrialising Regimes (BAIRs) involved strong state control of economic activity, disciplining both capital and labour in a national effort whose success provided the state's legitimacy. This strong state plans its economic and industrial development and mobilises, either through SOEs or a carrot and stick inducement of private local capital, to create the preconditions of economic success. The role of the state thus remains central in capital accumulation, whatever form the state takes – the national security states that characterised NEA, the developing states of SEA which were establishing their territorial control at the same time as industrialising, the police mandarin state of the PRC, or the Indian state (I shall leave it to the reader to choose the adjective here). What has also been shown is that this state-capital nexus, in whatever form, is highly toxic.

Toxic development

It is been clearly shown in the country studies that this process of industrialisation has been, in Asia as in the US and Europe, toxic. As surely as night follows day, environmental crisis followed economic development. But toxic development spreads much more widely than the instances cited in this review. Hand in hand with petrochemical development in Asia has gone the development of the metal and mining industries, electronics and motor vehicles, all highly toxic industries.

In fact it is hard not to see most of the economic development that has occurred in Asia as toxic. The lunatic rape involved in all the extractive industries – logging, oil, mining – has led to an environmental crisis spreading throughout all of Asia, battering down every Chinese wall and extending capital's reach to some of the up-until-now most isolated areas.

The toxic effects of development occur throughout the production cycle – from extraction to refining and production to eventual use throughout manufacturing industry and to the disposal of by-products and waste. Industrial hazards then refer to the hazards of industrialisation and cover a wide range of results from the direct effects of toxic agents to the eviction and 'resettlement' of people to attacks on subsistence itself. While many specific hazards can be traced to specific MNCs, we have also seen that local capital can be highly toxic. Thus it is not the form of capital that is important, but the toxic nature of the production process

itself which is a threat. The western concept of economic development has come under sustained attack in recent years, while a critical consensus considering development in itself to be detrimental appears to be beginning to come together.

Disposable workers

And here is the third public secret behind Asian 'economic dynamism', a central figure in Asian industrialisation that up until now has appeared in this text mainly as a dead or wounded body during an outbreak of burning factory syndrome or other toxic outrage. The position of women workers in the Asian miracle comes as no surprise and has been adequately documented by now. The dominance of capital over labour, which is the fuel of industrialisation in Asia, is expressed paradigmatically in the case of the workers dying because they were unable to escape the prison factories in which they worked.

Here again women workers also suffered under the third burden of being migrant workers, another group of unsung heroes of Asia's industrialisation. Their place in production is in the most toxic spheres, again emphasising their disposable nature.

The essential nature of the process is unchanged, only accelerated. This is disposable labour, whether now in a fire, or five years later when they go blind or are slowly poisoned. It is also a common thread in Asian industrialisation and capital accumulation. The extraction of surplus exemplified in the burning bodies of migrant women workers in the Pacific Rim finds its echo in the form of accumulation involved in bride burning in India. (Mies)

As well as decimation through explosion and fire, the Asian working class faces many other hazards at work. These hazards combine both those experienced during the original industrial revolution in Europe and those associated with new post-World War II chemical technology.

A report for the International Textile, Garment and Leather Workers Federation (ITGLWF) describes conditions in Asian textile and garment plants that rival those much vilified conditions present in nineteenth century US and British textile mills: 'Closed, poorly lit rooms designed to preserve dampness in fibres cause arthritis and laryngitis, while excessive dust and fumes contribute to incidence of brown lung disease. Dermatitis and allergies commonly occur as a result of contact with tissues and dyes.' (Pyle: 44-45)

A report published by the International Confederation of Free Trade Unions (ICFTU) in April 1996 has condemned EPZs, which now employ up to 40 million workers around the world, as concentrations of child labour, toxic waste dumping grounds and centres for the harassment and murder of trade union activists. The report declared that EPZs create conditions 'more like the hell of concentration camps for millions of workers'. The report 'cites a shocking catalogue of abuses in most of the 70 countries with EPZs. Trade unionists have been assassinated, child labour is rife, workers have been force-fed amphetamines so they can endure longer shifts and workers can be virtual prisoners employed on starvation wages.' (*WHIN* 47/48: 3)

Other critics have criticised Asian economic development activities, including subcontracting, as a variant of the provision of sexual services by sex workers: 'Like the women who are rented out to clients, developing nations operate through the subcontracting of their properties, whether buildings, facilities, land or labour, to client companies ... What this provision of facilities entails, however, is a specialization that destroys the nation's productive capacity and reduces it to a field to "come in and do ... " – very much as these women are reduced to a sexual function. Short-term investments and limited time horizons are merely economic equivalents of the "short-times" clients enjoy with their prostitutes.' (Tadiar: 200)

As to the more recent chemical hazards, what is stunning is the lack of available information. In an article which illustrates his point, one occupational health specialist reports, 'Very few data on exposure to carcinogens are available in developing countries.' (Vainio: 172)

With the move up the product ladder, hazard does not disappear; it simply changes form. With the North-East Asian NIEs putting their faith in future science-based production, disabling injuries like loss of limbs and being crushed to death by mechanical equipment will decrease but Repetitive Strain Injury (RSI) and other chronic injuries and diseases, such as cancer, will increase.

Where the strong state is weak

When the environmental effects of their policies became not only clear but also a source of conflict with their populations, Asian states needed to manage and neutralise the conflict. Here Asian states took the same course as was taken in core countries: formation of government

agencies or ministries entrusted with care of the environment, passing of legislation on environmental matters and setting up various forms of official oversight of the environmental effects of industry. In theory, this regulation is intended to prevent ecological damage.

In practice, however, it is a different story. Thus most Asian countries have as many, and often as strict, laws as do core countries. The problem lies of course with the implementation of these laws. Time and again we have heard environmentalists and others bemoan the lack of enforcement of these environmental regulations.

One reason for the failure of state regulation is that environmental officials and agencies suffer from a serious lack of power. In general the Departments of the Environment or Environmental Protection Agencies have been small, fledgling bureaucracies, easily out-muscled and out-resourced by the big boys of the Finance or Industry or Trade Departments. They also lack staff and resources. Thus, while the state created a notional system of pollution control and environmental protection, it ensured this system could not work by giving it neither staff, equipment nor punitive penalties.

This paradox is evident in the almost universal adoption of EIA requirements for new projects, which in practice has simply operated as a powerless legitimation method and as a way of satisfying World Bank and similar bodies' rules. A critical academic review notes: 'Practical experiences from Thailand and the Philippines, the two countries having the longest EIA experience in Asia, show that out of several thousand impact statements processed during the past decade, not a single project was denied clearance due to environmental reasons.' (Werner: 19)

Adopting crisis technology

One *mantra* for the toxic development of Asia has been 'modernity', an attempt to convince the population that the technology in use is the most advanced possible and therefore safe. Often emphasis is placed on the western origin of the technology: this assures the listeners that the technology being used is cutting-edge, most advanced, indeed state-of-the-art.

The most obvious example has been the presentation of incineration technology as a cutting-edge technical solution to the social and political, as well as the environmental, problems resulting from landfills and toxic waste dumps. This presentation naturally ignores the environ-

mental problems associated with this technology, and normally fails to point out the major opposition this technology faces in the core countries.

The export of incineration technology should be seen as the export of crisis technology. Having exported the environmental crisis, the core countries now export an unsatisfactory solution which was developed to deal (and only did so inadequately) with the crisis in the core countries. Thus the export of pollution control technology follows the export of pollution creating technology.

Similarly we may see the export of environmental organisations, particularly that of Greenpeace, as the export of another unsatisfactory response to environmental crisis. Recognising its niche market in the core countries is becoming saturated, Greenpeace now chases the same market in peripheral countries.

Here again, the export of nuclear technology from core to peripheral countries is another example of the export of crisis technology. At its last gasp in the core countries, the nuclear industry is being put on a respirator by increased use of nuclear power in peripheral countries. The increasing dependence of power-poor Asian countries on nuclear technology can only be described as a disaster and another example of the dubious benefits of modernity.

Assault on the land and the people

The denuding of the forests is a major sign that capital has come to reign. In Asia, along with logging came mining, oil and LNG extraction and industrialised fishing and aquaculture.

The first phase of industrialisation involved no limits. In the rush to industrialise, nothing was sacred: all was grist for the mill, nothing was too important to sacrifice at the altar of economic development.

More is going on here than just economics. The assault on the forests is not only to feed capital's ravenous need for raw materials, but also to reduce the space that is outside the control of capital. The woods have traditionally been a place for bandits, those who conduct raids into the commodity economy for booty, those who escape beyond its clutches to 'bandit country'. Capital can only continue to exist by continually expanding, drawing more of the world into its maw and by stamping out all alternatives. From this stems the jungle line, which extends through the

jungles and forests, not only of dynamic Asia but also of Oceania, Latin and Central America and Africa.

Thus the primary phase of industrialisation was that of primary accumulation: the living environment, not just trees, minerals and oil, but also air, water and land was ripped off, destroyed, made dead, to accumulate dead labour, or capital. And similarly with people. The Asian industrial revolution was based on the next-to-slave labour of women workers, disposable bodies on an ever-shifting production line. Capital, like a vampire, ever shifts on in search of new blood, new energy to feed the machine, continually replacing the frontier, as each new frontier gets burned out.

In response to this invasion and encroachment by capital, a wave of struggles has arisen throughout Asia. These struggles have been geographically based, as various combinations of groups attempted to prevent capital gaining this particular piece of ground, using that particular lake, fishing this area, leaving its waste in that place.

These have often been life and death struggles fought between the indigenous population and invasive capital, whether transnational or national, where communities have attempted to prevent the obliteration of their traditional way of life by preventing their integration into the capitalist world-system. These struggles have spread throughout Asia in response to the spreading of capital's tentacles. Communities have responded to resist resource extraction industries such as mining and forestry, to the development of infrastructure – especially power production through dams and nuclear power, essential to power the miracle – and industries, as well as tourism projects. The tactics used by these communities have varied from traditional peasant obstructionist tactics through political lobbying to varieties of direct action up to armed struggle (as in Bougainville).

Fight the power

In the words of R Guha, 'If the transition to both industrialism and capitalism must necessarily remain incomplete in most of the Third World, the primary reason for this is ecological.' (Guha: 193) Another observer notes, 'Pollution in Japan has decreased not because of the conscious efforts of Japanese industry, but rather because Japan has used its economic strength to send the problems of industrial development elsewhere. The Third World cannot be expected to follow the same path to mod-

ernization as the developed world, because it simply cannot push its environmental problems onto other countries.' (Yasushi: 61)

McCormack points out that the Japanese model, in ecological terms, rather than a success to be emulated, is a disaster to be avoided: 'The deliberate abandonment of one of the world's most sustainable and environmentally benign agricultural traditions, combined with the pursuit of unsustainable levels of urbanisation, consumption, waste and pollution, a preference for private over public transport ... The projection ... throughout EA and SEA of the Japanese way of mass consumption and mass waste, infinite manipulation of human desires in order to promote "growth", abandonment of the rural sector and concentration of the population in megalopolises ... is nothing short of a high road to catastrophe.' (McCormack: 149)

And here we return to the supposedly defunct limits to growth thesis, as McCormack quotes Sachs to the effect that if all countries followed the Japanese way, five or six planets would be required as sources for inputs and sinks for waste: 'For example, Japanese consumption patterns now call for the appropriation of two fifths of world shrimp and nearly one half of its tuna (one quarter of all traded marine products) and also a large proportion of beef and other meats, grains and increasingly fruit and vegetables. They entail the appropriation of the agricultural produce of a land area beyond its own borders two and a half times the size of that which lies within them, not to mention the oil, coal, copper, lead and other non-renewable materials that are swallowed in the inexhaustible system of production, consumption and waste.' (McCormack 1999: 149) Smith makes the same point regarding the enlisting of a further billion consumers via the emulation of the Japanese way in the PRC.

Given such structural impediments, and the local state's commitment to industrial development, it is obvious that reformist suggestions or recommendations for increased state regulation will not succeed in eradicating these problems. They have not succeeded in removing them in North America and Europe: there is no reason to suppose such measures will deal with them in Asia either. The difficulty is that harm to the environment and the public health is not a side-effect of generally beneficial economic development, but that economic development cannot exist without the damage it imposes in this way.

If the cause of these crises is development, it is necessary to fight development itself. This involves a struggle with the local state and the local elite as development is, in the words of Rudolf Bahro, a conspiracy between the elites of north and south. Economic development results in inevitable crisis: accelerated development leads to accelerated crisis.

What is needed in response to capital's advance is continuous basic opposition to the extension of capital's control. There is a need for both a practical and ideological battle against development in both core and peripheral regions. This means that groups must continue opposition to capital's plans, while at the same time forming alliances with other groups opposing similar outrages. Just as popular action forced pollution-intensive industry out of core and semi-peripheral countries such as Japan and Taiwan, so popular opposition can ensure that current systems both of production and distribution, both in core and peripheral countries, are under continuous pressure. This is a battle of subsistence against accumulation, of local culture against capital's mono-culture, of communities against enclosure, of labour and peasants against capital and its lackeys, of use against exchange, and, in the last analysis, of life against death.

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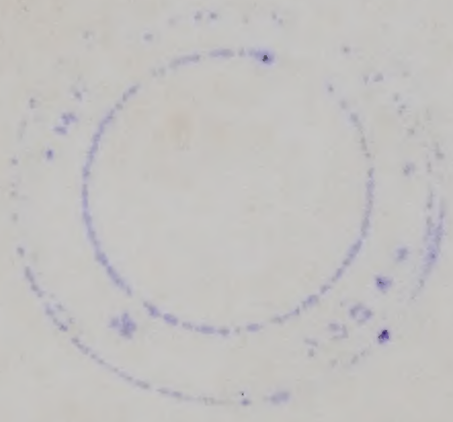

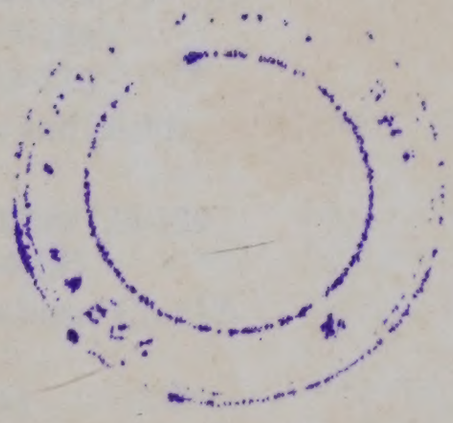

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Asphyxiating Asia

Most of the economic development that has occurred in Asia is toxic in nature, writes Tomas Mac Sheoin in this remarkable documentation of the slow transfer of polluting and hazardous industries from the so-called developed world to the Asian region.

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Toxic development is as essential to the Asian economic miracle as the super-exploitation of migrant female workers, military rule, suppression of unions and other political organisations, control of information and censorship, subcontracting and other less celebrated characteristics of Asian industrialisation.

Tomas Mac Sheoin has been involved in anti-nuclear and anti-toxic struggles in Ireland. His earlier books (under the pen name T James) include *Corporate killing: Bhopals will happen* (Free Associations, 1988) and (as co-author) *Guests of the nation: the people of Ireland versus the multinationals* (Earthscan, 1990).

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